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Note.—Initialled abstracts are written by the following:—

Mr J. L. Fyfe	J. L. F.
Mr H. O. Hartley	H. O. H.
Mr L. E. Morris	L. E. M.
Dr J. Wishart	J. W.

*General studies, see also individual crops.

Plant Breeding Abstracts.

Vol. IX, No. 2.

Part 1. Empire Section

STATISTICS 519

549. McMULLEN, L. 519:007
"Student" as a man. 631.421:007
Biometrika 1939 : 30 : 205-10.

PEARSON, E. S.
"Student" as statistician.
Biometrika 1939 : 30 : 210-50.

A very full account is given of the contributions of W. S. Gosset ("Student") to statistical theory and to the practice of field experimentation. A list of his published papers is added.

550. MILES, L. G. and 519.24
BRYAN, W. W.
The analysis of co-variance and its use in correcting for
irregularities of stand in agricultural trials for yield.
Proc. Roy. Soc. Qd (1936) 1937 : 48 : 30-34.

The authors illustrate, by means of an example of a 10 x 10 Latin square maize varietal trial, how to correct yield for variable stand by means of an analysis of covariance, and how to calculate the adjusted yields based upon equal stand. Readers should note, however, that the z-test of significance is not strictly applicable in the way shown, while an adjustment is also necessary in the calculation of the standard errors of differences between adjusted varietal means. J. W.

551. TANG, P. C. 519.24
The power function of the analysis of variance tests with tables
and illustrations of their use.
Statist. Res. Mem., Dep. Statist. Univ. Lond. 1938 : 2 : 126-49.

The general mathematical problem involved in the use of Analysis of Variance and Covariance has been studied by Neyman who has evolved a Power Function of the test. The main interest to practical experimenters of this paper, which is otherwise entirely theoretical in character, is the provision of a probability-integral table, which provides the probability of the second kind of error for 1 per cent and 5 per cent levels of significance for various numbers of degrees of freedom. The use of the table is illustrated. J. W.

552. BOURNE, J. B. 519.24:631.421
The importance and use of appropriate assumed means in collating
field experimental results statistically.
Trop. Agriculture, Trin. 1938 : 15 : 247-58.

This paper describes, with detailed examples, methods for combining the results of several experiments when a different "assumed mean" is used for each.

GENETICS 575.1

553. KOSTOFF, D. 575.11-18:581.162.5
An important genetic constant.
 Curr. Sci. 1938 : 7 : p. 238.

It is pointed out that Ch. Nek Alam's segregation constant of approximately 3 for quantitative characters (Cf. "Plant Breeding Abstract", Vol IX, Abst. 10) is liable to disturbance in cases where all gametes formed by the F_1 hybrids are not equally likely to effect fertilization. This will be the case, for instance, in self-incompatible plants and in structural hybrids.

554. McMILLAN, J. R. A. 575.116.1:575-18:519.241.1
The use of the coefficient of correlation of quantitative characters as a measure of gene linkage.
 J. Coun. Sci. Industr. Res. Aust. 1938 : 11 : 311-16.

Many investigators have used the correlation coefficient as a measure of the linkage of genes governing quantitative characters. It is shown that in most cases this is an unreliable procedure, since any apparent correlation may be due to either gene linkage proper or to physiological or micro-environmental interactions which are independent of linkage. The latter types of correlation may entirely obscure or actually reverse a correlation due to gene linkage. It is shown that in certain cases the difficulty may be overcome by correlating values of characters for samples derived from separate experiments. If, for instance, it is desired to determine whether a genetic linkage exists between rust resistance and yield in wheat, it is useless to do this from one experiment, since susceptibility to rust directly reduces yield under conditions of infection. If, however, part of the material available could be grown to determine susceptibility to rust and the remainder grown under rust-free conditions to determine potential yielding ability, a more reliable measure of genetic linkage could be obtained by correlating the two.

ORIGIN OF SPECIES, Etc. 576.16

555. RAMSBOTTOM, J. 576.16:575.12
Linnaeus and the species concept. Presidential address delivered on the 24th May, 1938, during the 150th anniversary celebrations of the Linnean Society of London.
 Proc. Linn. Soc. Lond. (1937-38) : 30th December, 1938 : Pt. 4 : Session 150 : 192-219.

An account of the views of Linnaeus on the fixity of species and on the possibility of the origin of new species and varieties by hybridization.

CYTOLOGY 576.3

556. KOSTOFF, D. 576.356.5:575.22
Directed hereditary variations conditioned by euploid chromosome alterations in higher plants.
 Nature, Lond. 1938 : 142 : 117-18.

The effect upon various plant characters of a euploid increase in chromosome number, and the relationship between length and number of chromosomes and the amount of reduction of fertility caused by autopolyploidy are discussed (Cf. "Plant Breeding Abstracts", Vol. IX, Absts. 18 and 21).

It is pointed out that when employing polyploidy as a means of crop improvement, the plant breeder can usually predict the direction of the morphological changes which will be brought about.

BOTANY 58

557. GATES, R. R. 58:007:575.1
Prof. E. M. East.
 Nature, Lond. 1938 : 142 : p. 1027.

An obituary notice in which the contributions of Professor East to the science of genetics are reviewed.

558. KLINGSTEDT, H. 581.162.5:575.115:575.127.2

Genetics of hybrid sterility.

Nature, Lond. 1938 : 142 : p. 1118.

Certain parallels between cases of genic sterility in hybrids between species or races and similar disturbances caused by single genes are pointed out.

The writer puts forward the following genetic explanation of hybrid sterility. He considers that many species may accumulate a series of recessive sterility genes which have individually a small effect, but are cumulative. Species and races subsequently combined in crosses will probably by chance have acquired a different set of such genes after their isolation from each other. He further assumes that each species carrying such genes must also have a specific genetic system which renders the genes recessive, and that such a system would break down on crossing, rendering the formerly recessive sterility genes dominant or partly dominant.

FIELD TESTS 631.421

559. CORNISH, E. A. 631.421

Factorial treatments in incomplete randomized blocks.

J. Aust. Inst. Agric. Sci. 1938 : 4 : 199-203.

The author points out that factorial systems of treatments may be employed in connexion with the method of balanced incomplete blocks, though he emphasizes that he does not advocate their indiscriminate use. He considers a simple case of two factors by way of illustration, and gives an example based on data of Youden.

560. YATES, F. 631.421:519.24

The comparative advantages of systematic and randomized arrangements in the design of agricultural and biological experiments.

Biometrika 1939 : 30 : 440-66.

The recent claims made by "Student" (W. S. Gosset) (Cf. "Plant Breeding Abstracts", VIII, 1012) and others in favour of systematic arrangements of plots in field experiments are critically examined. It is concluded that, in most cases, the gain in accuracy with systematic arrangements is not likely to be large enough to outweigh their disadvantages. The half-drill strip method particularly favoured by "Student" is shown probably to be less accurate than suitable random arrangements occupying the same plots. Systematic arrangements may in certain cases give decidedly greater accuracy than randomized block experiments, but it seems likely that the use of such devices as confounding, quasi-factorial designs or split-plot Latin squares in these cases is likely to give a similar gain in accuracy, at the same time being much more satisfactory statistically.

The uniformity trial chosen by Barbacki and Fisher (Cf. "Plant Breeding Abstracts", Vol. VII, 834) to illustrate the defects of the half-drill strip method is re-examined, and "Student's" criticisms of the work of these authors are discussed.

561. HUDSON, H. G. 631.421:519.24:633.11(42)

Population studies with wheat. I. Sampling.

J. Agric. Sci. 1939 : 29 : 76-110.

A description is given of two large scale experiments designed to determine, among other things, the best method of taking samples from plots in field experiments in cases where it is impossible to obtain data from whole plots. In each case the wheat variety, Holdfast, drilled in the ordinary way, was the experimental material.

Observations of various plant characters were made on each of 7,200 six-inch lengths of drill row in each experiment, these small plots subsequently being grouped in various ways to determine the optimum size and shape of sampling unit.

The lowest sampling error was obtained by using the smallest sampling unit. This size of unit cannot be used in practice, however, owing to the large number of separate observations which would be required. The best size of sampling unit consisted of 3 feet of each of two

adjacent rows, though a unit consisting of 18 inches of five adjacent rows was almost as good; size of sampling unit was more important than shape.

The percentage of the plot that must be taken as a sample, varies with the plant character under observation and with the size of the plot. Grain weight was found to necessitate a sample about twice as large as plant, stem or ear number, the size of the sample in the former case being 5 per cent in $\frac{1}{20}$ acre plots, 15 per cent in $\frac{1}{100}$ acre plots and 43 per cent in $\frac{1}{600}$ acre plots if the plots were not subdivided.

Subdivision of the plots greatly decreases sampling error, since any large scale variations such as fertility trends can be eliminated. Subdivision into pairs of rows is suggested, as by this means variation caused by differences between the coulter of a drill may be eliminated. The numbers of samples required from various sizes of plot subdivided in this way are considered.

An alternative method, of weighing the total produce of the plots and sampling for the grain: total produce ratio is also discussed. It is thought that this method may have wide application, particularly in trials on farms away from the experiment station. Low sampling errors for the ratio were found.

562. VAIDYANATHAN, M. 631.421:519.24:633.51
Discussion of sampling methods in developmental studies on cotton and the statistical treatment of results.
 Indian Cent. Cott. Comm., 1st Conf. Sci. Res. Wkrs. Cott. India, Bombay (1937) 1938 : 424-36.

Methods are given of estimating the efficiency of a sampling method, and of determining the number of sampling units per plot necessary to give a required level of standard error for a given number of replications.

It is concluded that in the case of cotton it is not feasible to use the sampling methods used for cereals, owing to the fact that the crop is not so thick and regular.* A certain number of plants chosen at random from each plot seems to be the only feasible method.

563. MACDONALD, D.,
 FIELDING, W. L. and
 RUSTON, D. F. 631.421:519.24:633.51(68.2)
Experimental methods with cotton. I. The design of plots for variety trials.
 J. Agric. Sci. 1939 : 29 : 35-47.

The results of three uniformity trials with U4 cotton at Barberton, South Africa, are reported. In spite of the fact that two of these trials were carried out in a dry year and the other in a wet year, accounting for very different yields, the conclusions reached as to optimum plot size and shape in each case agreed closely.

The percentage standard error per plot decreased rapidly as the plot was lengthened but tended to increase as the width of plot increased. With plots of the same size, the efficiency therefore increased as the plot became narrower and longer. This is attributed to a general small-scale patchiness in yield found in cotton crops in the Barberton district, with little tendency to any regular fertility gradient.

With plots of the same shape, the smallest plots were the most efficient, i.e. gave more information per unit area of land covered. In practice, however, a very large number of very small plots is inconvenient and it is better to have fewer, somewhat larger plots, even though the total area planted must thereby be increased. The plots actually used in experiments at Barberton are 160 feet in length and 2 rows wide. One row plots are not adopted, though more efficient, because they are not considered to be broad enough for making observations on growth and development.

The standard error increased as block size was increased by the addition of more plots, thus indicating the desirability of keeping the number of strains in a variety trial as low as possible.

CEREALS 633.1

564. WATERHOUSE, W. L. 633.1-2.452-1.521.6:575(94)
Presidential address. Part I. General. Part II. Some aspects
of problems in breeding for rust resistance in cereals.
 J. Roy. Soc. N.S.W. 1938 : 72 : 1-54.

A survey of the present state of knowledge of rust diseases of cereals in Australia and New Zealand, of the resistance of varieties to different strains of the various rusts, and of the more general aspects of the problem of breeding for rust resistance.

Details are given of the number of isolations of various strains of *Puccinia graminis tritici*, *P. triticea* and *P. graminis avenae*, made in Australia and New Zealand since such determinations were commenced. In the case of *P. graminis tritici*, a surprising change in the rust population has occurred since 1926. In that year Race 34 first appeared, and since 1929 it has been practically the only race of the fungus occurring in either country. At present, Ford is the only commercial wheat variety grown which has any resistance of value to Race 34. It is pointed out that the production of further varieties resistant to this race is only likely to be a temporary victory for the plant breeder, since Race 34 is known to be heterozygous and may sooner or later give rise to other widespread races by segregation in its alternative host. The case is one requiring constant co-operation between the pathologist and plant breeder. Similar considerations apply to the other rust diseases.

In the author's opinion, further important progress in breeding for rust resistance will be made by the use of "wide" (interspecific and intergeneric) crosses.

WHEAT 633.11

565. KADAM, B. S., and 633.11:575(54.7)
 KULKARNI, R. K. 633.11 Bansi
Genetic improvement of wheat in Bombay. 2. Bansi-168 and
Bansi-224.

Agric. Live-Stk India 1938 : 8 : 675-82.

Two improved wheat varieties, Bansi-168 and Bansi-224, both selections of the local Bansi (*T. durum*) wheats of Bombay, are described. Bansi-168 is well suited to the West Khandesh district, while Bansi-224 is grown in the Bhal tract of Gujarat and in East Khandesh. Both show considerable increases in yield over the local mixtures, but are susceptible to black stem rust. Bansi-224 is rather too late-ripening for the East Khandesh district, and the possibility of using Bansi-168 in that region is being investigated.

566. 633.11:575(94.5)
633.13:575(94.5)
633.16:575(94.5)

Guide book to the State Research Farm, Werribee.

Dep. Agric. Vict. 1938 : Pp. 42.

In this publication the experimental work being conducted at the Victoria State Research Farm at Werribee is described. One of the most important aspects of the work is the breeding of wheat, oats and barley.

Wheat varieties bred at the farm occupied 81 per cent. of the total wheat area of the State in 1937, the main varieties so far released being Ghurka, Ranee 4H, Free Gallipoli, Sepoy, Rajah, Regalia and Mogul. Breeding is for improved yield and quality, together with resistance to flag smut (*Urocystis tritici*) and to a lesser extent to loose smut (*Ustilago tritici*), stinking smut and rust.

An analysis of the yield of three new varieties produced, compared with Federation, shows that the extra yielding ability of these varieties is due in each case to a different factor; Ranee has a superior number of ears per plant, Rajah has larger ears, and Free Gallipoli has a higher 1,000 grain weight. Analyses of this kind are expected to be of use as a guide to selection for yield in the early stages of breeding. It is suggested also, that the percentage of tillers produced in spring which carry ears at harvest may be a useful measure of drought resistance, those varieties producing least unproductive tillers being, in general, the most drought resistant.

A large number of introduced varieties is being tested each year for resistance to flag smut, the most resistant being used as parents in crosses. Ghurka and Rajah x Gallipoli are both highly resistant to the disease.

A collection of the highest quality wheats of the world is being built up, and the more promising are being used in crosses with high yielding Australian forms.

With regard to oats, the need is for prolific drought resistant forms suitable for hay and grain, and also for varieties suitable for early green feed. Three varieties have so far been evolved, Palestine, Dawn, and a selection of Algerian. Attention is also being devoted to the breeding of oat varieties resistant to loose and covered smut (*Ustilago avenae* and *U. levis*), for which purpose resistant American varieties are being crossed with high yielding local forms. The question of milling quality is also receiving attention.

Both malting (two-rowed) and feed (six-rowed) barleys are being bred. Importations from various parts of the world have been made to discover barleys of exceptional earliness, with resistance to covered or loose smut (*Ustilago hordei* and *U. nuda* respectively), or with superior malting quality. Such forms are being crossed with local varieties. The earliest parent forms have been obtained from India, and the best quality from England and Czechoslovakia.

Attention is also being directed to the production of smooth-awned barleys. It has been possible to raise three generations of barley each year on the breeding plots, two under normal lighting conditions and one in a bird-proof cage equipped with electric light.

567. HACKWELL, A. B. and 633.11:575(94.5)
 McKEON, B. F. 633.11.00.14(94.5)
Wimmera wheat tests. Trials at Longerenong.
 J. Dep. Agric. Vict. 1938 : 36 : 573-85.

Wheat hybridization work and the growing of the F_1 hybrids in Victoria are centralized at the State Research Farm, Werribee, subsequent generations being grown at the various experimental stations in the State, where selections are made. The Cereal Experiment Station at Longerenong is one of the stations where such work is done.

Variety trials are summarized, in which various standard varieties are compared with new hybrid selections.

568. 633.11:575.127.5:633.289
 PETO, F. H. 576.356.5:581.036
Hybridization of *Triticum* and *Agropyron*. V. Doubling the chromosome number in *T. vulgare* and F_1 of *T. vulgare* x *A. glaucum* by temperature treatments.
 Canad. J. Res. 1938 : 16 : Sect. C : 516-29.

Heat treatment of spikes of Marquis wheat at 42, 43 and 44° C., 16 or 24 hours after self-pollination, induced chromosome doubling in 2 per cent of the plants.

A wide variety of heat treatments, including alternating high and low temperature shocks, was applied to more than 13,000 wheat florets 16 to 27 hours after being pollinated with *Agropyrum glaucum* pollen. Only one of the resulting plants showed chromosome doubling, so that it can be concluded that the induction of polyploidy by heat treatment in this material is extremely difficult.

The 84-chromosome Marquis plants produced in these experiments were sterile, the anthers failing to dehisce. The single amphipolyploid *Triticum-Agropyrum* plant grew slowly and failed to produce ears.

569. 633.11:575.127.5:633.289
 RAW, A. R. 576.356.5:581.04
Intergeneric hybridization. A preliminary note of investigations on the use of colchicine in inducing fertility.
 J. Dep. Agric. Vict. 1939 : 37 : 50-52.

Young shoots of a sterile F_1 plant, *Triticum vulgare* x *Agropyrum intermedium*, were treated with colchicine. One of the resulting plants proved to be fully fertile, presumably owing to chromosome doubling.

570. JOHNSON, L. P. V. 633.11:575.127.5:633.289(71.3)
Hybridization of *Triticum* and *Agropyron*. IV. Further crossing results and studies on the F₁ hybrids.
 Canad. J. Res. 1938 : 16 : Sect. C : 417-44.

JOHNSON, L. P. V.,
 McLENNAN, H. A. and
 ARMSTRONG, J. M.
Fertility and morphological characters in *Triticum-Agropyron* hybrids.
 Genetics 1939 : 24 : 91-92 (Abst.).

Eighteen *Agropyrum* species were crossed with a large variety of wheat forms. Only *A. glaucum* and *A. elongatum* crossed successfully, but in these cases, crosses with both tetraploid and hexaploid *Triticum* species were readily obtained.

Many of the F₁ grains were shrivelled and deficient in endosperm. In such cases, higher plant establishment was obtained by the use of a 2 or 5 per cent glucose solution.

In the F₁ plants, the characters of the *Agropyrum* parent were for the most part dominant. The F₁ plants involving *A. glaucum* were completely sterile (with one or two possible exceptions), but in the crosses involving *A. elongatum* a fair proportion of the F₁ plants showed low to moderate degrees of fertility.

Observations on the first three generations of *A. elongatum* hybrids showed that continued selection of the more fertile segregates will quickly lead to the establishment of lines reasonably constant for high fertility.

The practical objective of the work is to produce new perennial, large seeded, drought-resistant forage plants adapted to the drier areas of western Canada. The undesirable characters of *Agropyrum*, coarse, harsh-textured stems and leaves and small seeds will be selected against, while endeavouring to retain perennial habit, extensive root system, hardiness and vigour. As types more like *Triticum* than most of the F₂ segregates will be required, back-crosses to the *Triticum* parent have been made. The self-sterile *A. glaucum* hybrids have in many cases given highly fertile wheat-like types when back-crossed to *Triticum*. In the back-cross population the proportion of perennial segregates is reduced.

571. 633.11-2.452-1.521.6:575(67.62)
 632.452:576.16:633.11

A new wheat rust in Kenya.
 Rhod. Agric. J. 1939 : 36 : 3-4.

A fifth and new form of *Puccinia graminis tritici*, K5 has been recorded in Kenya. A breeding programme to combat this form is already in hand and two new hybrids, one of which is already being propagated in bulk, have shown resistance to it. The variety Sabanero appears to be resistant to race K5 under normal conditions.

The present Kenya wheat hybrids have shown marked resistance to a large number of forms of rusts in other parts of the world and further resistant forms are being bred. It is hoped that these would be of value in the event of the appearance of any new strains of stem rust in Kenya.

Importation of seed wheat into Kenya, except for experimental purposes, is prohibited as a safeguard against the introduction of new races of rust.

BARLEY 633.16

572. 633.16:575.42(41.5)
 633.13:575.42(41.5)

Report of the seed propagation division, 1937.
 J. Dep. Agric. Éire 1938 : 35 : 250-65.

An account of the barley and oat propagation work carried out by the Division in 1937. This consists chiefly of reselection from "pure lines" of the most important varieties, followed by propagation and distribution of pure seed stocks.

573. MEREDITH, W. O. S. and
ANDERSON, J. A. 633.16:581.192:663.421:519.24
Varietal differences in barleys and malts. IV. Commonly measured properties and their correlations with nitrogen and 1,000-kernel weight.

Canad. J. Res. 1938 : 16 : Sect. C : 497-509.

A comparison was made between 12 different barley varieties grown at 12 widely separated Canadian experiment stations, with regard to certain malting properties and their correlations with nitrogen content of grain and 1,000-grain weight. The only significant intervarietal correlation found was a partial correlation ($r = 0.609$) between diastatic activity and 1,000-grain weight, independent of nitrogen.

574. BRIGGS, F. N. and
STANFORD, E. H. 633.16-2.421.1-1.521.6:575.116.1
Linkage of factors for resistance to mildew in barley.

J. Genet. 1938 : 37 : 107-17.

The barley varieties Algerian (C.I. 1,179), S.P. 1. 45,492 and Kwan (C.I. 1,016) each differ from the susceptible variety Atlas by one factor determining resistance to barley mildew, *Erysiphe graminis hordei*.

The factor carried by Algerian is different from the four factors previously found to determine resistance in other barley varieties. It is designated Ml_a , and is completely dominant. The variety S.P.1. 45,492 is similar in genetic constitution to Algerian with respect to its mildew resistance.

Kwan carries a factor for resistance which is different from the four previously discovered, and from Ml_a . This factor is designated Ml_k . The factors Ml_a and Ml_k were found to be linked, with approximately 10 per cent of crossing-over. The factor Ml_a is inherited independently of the factor pair for long haired v. short haired rachilla.

MILLETS AND SORGHUMS 633.17

575. RANGASWAMI AYYANGAR, G. N.,
HARIHARAN, P. V. and
RAJABHOOSHANAM, D. S. 633.171:519.241.1:631.557
A metrical study in *Setaria Italica* (Beauv)—the Italian millet.
Madras Agric. J. 1938 : 26 : 368-73.

A study of the correlations between yield of the main ear and of all the ears of *Setaria italica* varieties and various other plant characters.

576. RANGASWAMI AYYANGAR, G. N.,
PANDURANGA RAO, V. and
VENKATARAMANA REDDY, T. 633.174:575.11.061.6
The occurrence and inheritance of purple anthers in sorghum.
Proc. Indian Acad. Sci. 1938 : 8 : Sect. B : 317-23.

Purple anther colour in sorghum is determined by a single gene P_{an} . The colour is more intense in some races than in others. In intensely-pigmented lines the heterozygote is intermediate, but in lightly-pigmented lines the gene behaves as a simple dominant. Various parts of the plant other than the anthers are also pigmented when the gene P_{an} is present. Asiatic cultivated sorghums lack the gene, which is found in East African and Nigerian forms.

577. RANGASWAMI AYYANGAR, G. N.,
PANDURANGA RAO, V. and
PONNAIYA, B. W. X. 633.174:575.11.061.6:581.48
The occurrence and inheritance of purple-tipped grains in sorghum.
Proc. Indian Acad. Sci. 1938 : 8 : Sect. B : 396-98.

Some American kafir varieties have a purple spot at the tip of the grain, which is feeble or absent in African kafirs. This character is a simple Mendelian dominant to non-spotted, the factor involved being designated P_{gr} .

In the presence of the factor Q the grain tip is reddish purple; in the presence of q it is blackish purple. The factor P_{67} is independent of the factor W which determines the manifestation of pericarp colour of the whole grain. (Cf. "Plant Breeding Abstracts", Vol. IX, Absts 309 and 310).

578. RANGASWAMI AYYANGAR, G. N. and KUNHI KRISHNAN NAMBIAR, K. 633.174:575.11-181
A "tiny" sorghum.

Proc. Indian Acad. Sci. 1938 : 8 : Sect. B : 309-16.

A new recessive gene in sorghum, in_{iv} , produces extreme reduction in internode length, giving "tiny" plants. The length of the leaves is also reduced, but their width is affected to a comparatively small extent. The spikelets are of practically normal size, and the ovaries set seed freely on open-pollination. "Tiny" plants are, however, practically male-sterile.

579. RANGASWAMI AYYANGAR, G. N. and PONNAIYA, B. W. X. 633.174:581.44:575.1
633.174:581.48
"Knife-cut" at the base of the peduncle of sorghum.

Curr. Sci. 1938 : 7 : 183-85.

The "knife-cut" character, a symmetrical transverse cut immediately above the node known to occur in sugar cane, may also occur at the base of the peduncle in *Sorghum*. It was found in a strain of Sudan grass, and is due to mechanical difficulties in ear emergence caused by excessive thickness of the leaf-sheath, a character probably introduced from *S. bicolor*.

RICE 633.18

580. JAGOE, R. B. 633.18:575.42(91)
633.18.00.14(91)
Padi selection and varietal trials 1937-38.
Malay Agric. J. 1938 : 26 : 497-529.

A detailed account of the padi selection work and varietal trials at the various Experiment Stations and Test Stations in twelve States and Settlements in the Malay Peninsula and in Borneo during the 1937-38 season.

581. PARTHASARATHY, N. 633.18:576.356:537.531:575.242
Cytogenetical studies in the Oryzae and Phalarideae. I. Cytogenetics of some X-ray derivatives in rice (*Oryza sativa* L.).
J. Genet. 1938 : 37 : 1-40.

Three mutants occurring in the progeny of X-rayed rice material are described. A semi-sterile mutant which gave normal, semi-sterile and dwarf offspring approximately in the ratio 1 : 2 : 1 was found to be a reciprocal interchange heterozygote, with an association of four chromosomes at meiosis. It is thought probable that the dwarf plants are homozygous for the interchange, which may be accompanied by a minute deficiency or a gene mutation at or near the point of interchange in one of the chromosomes.

The other two mutants, designated "stumpy" and "beaked sterile", were both trisomics. In the former case, an association of five chromosomes is frequent, indicating that the extra chromosome consists of segments derived from two non-homologous chromosomes. It is shown that in a proportion of cases a new trisomic type may be expected to arise from this form, and a new genetical type with long, narrow grains was actually observed in the progeny. The other trisomic was of the primary type.

ROOTS AND TUBERS 633.4

582. 633.42:575:578.08(93.1)
Breeding better farm seeds. Interesting work at the Agronomy Station, Lincoln.
N.Z. Fmr Wkly 1938 : 59 : No. 39 : 28-29.

The methods of *Brassica* breeding employed at the Agronomy Farm, Lincoln, Canterbury, N.Z., are briefly discussed. Illustrations are given to show the methods used for the isolation

of breeding material at various stages. The larger isolation plots at the Farm are enclosed in muslin cages in which a hive of bees is placed. The bird-proof cages used in out-breeding are also illustrated.

583. CALDER, R. A. 633.426:575(93.1)
Investigations leading up to the certification of rape seed in New Zealand.

N.Z. J. Sci. Tech. 1938 : 20 : 98A-105A.

The varieties of rape grown in New Zealand are of three main types: Giant, Broad-leaf Essex and Swede-like rape. Efforts are being made to improve each of these types, and improved certified seed of the first two is already available.

Two lines of Giant rape, of English and French origin respectively, were chosen for breeding purposes. The method adopted was to self-pollinate selected plants, and to select daughter plants from the best progenies. These were again selfed, and the inbred lines were then crossed together in pairs and the best F_1 progeny selected and multiplied. In later years further selection, self-pollination and brother-sister mating were effected in this progeny. The strains selected by this means had an average yield 25.6 per cent higher than the best open-pollinated Giant rape in 1938. It is proposed in the future to maintain by continued mass selection the standard of improvement already attained.

Improvement of Broad-leaf Essex rape was attempted in the same way, but the Dutch strain used had such a high degree of uniformity in the first place that no improvement was effected. Improvement is now being attempted by selection in a back-cross progeny (Broad-leaf Essex x Giant) x Broad-leaf Essex, the aim being to combine the best features of both parents. Swede-like rape has very low yield, but very high nutritive value. Attempts to improve it are being made by crossing it with the other two types.

584. [McINTOSH, T. P.] 633.491:575.255:575
Potato notes.

Scot. J. Agric. 1938 : 21 : 374-76.

Variations have been induced in a series of potato varieties by removing the tuber eyes and inducing growth from the deeper-lying tissues. These variations remain constant when vegetatively reproduced. A wide range of plant characters is involved in the changes, e.g. in the variety Gladstone, changes occurred in the time of maturity, distribution of tuber colour, presence or absence of tuber colour, texture of foliage, colour of stolons, colour of flower buds and flowers, and several other characters.

Some of the changes suggest that the parent variety is a simple periclinal chimaera, but in other cases the variety must be a complicated mosaic of cells of different genotypes.

FIBRES 633.5

585. RAMANATHA AYYAR, V. and
 BALASUBRAMANIA AYYAR, R. 633.51:537.531:575.243
Some effects of X-rays on Uppam and Karunganni cottons.
 Indian Cent. Cott. Comm., 1st Conf. Sci. Res. Wkrs Cott. India, Bombay
 (1937) 1938 : 393-400.

X-ray treatment of the pollen grains of two strains of *G. herbaceum* was found to stimulate plant growth in succeeding generations. No such effect was observed when the seed of two strains of *G. herbaceum* and one of *G. indicum* were X-rayed. Three recessive mutants were observed in the progeny of X-rayed seed material, two chlorophyll deficient and one meristic variant.

586. HUTCHINSON, J. B. 633.51:575
Some problems in genetics, whose solution would help the plant breeders.

Rep. and Summary Proc. 3rd Conf. Cott. Gr. Prob., Emp. Cott. Gr. Corp.
 1938 : 130-45.

A study of some of the more general aspects of cotton breeding. The relative merits of making "primary" and "secondary" selections are discussed. It is pointed out that primary

selection of a mixed variety will give a much greater advance on the varietal average than would secondary selection (re-selection of an improved, relatively homozygous variety). Dr Mason has held that primary selection alone is the best method of improving cotton varieties. The author disagrees with this view, since it is impossible to select in a very mixed variety for more than the larger differences. Smaller differences are only apparent in plots of relatively uniform material grown under uniform conditions. Secondary selection cannot usefully be continued indefinitely, however, since when genetic uniformity has been reached no further improvement is possible; one must then return to more variable material or produce such variability by hybridization.

The problem of degeneration of seed stocks is briefly discussed, and also the relative merits of pure strains and mixtures. It appears that under certain conditions, mixtures, even of different species, may be preferable to pure strains (e.g. the mixtures of *G. arboreum* and *G. hirsutum* grown in Central India). Such admixture is not a disadvantage from a technological point of view when the plants are grown mixed in the field; it is only a disadvantage when imperfect mixing of lints of different characteristics occurs subsequently.

Further genetical data are required to elucidate the problem of the acclimatization of cotton varieties grown in new areas.

587. HUTCHINSON, J. B.,
GADKARI, P. D. and
ANSARI, M. A. A. 633.51:575
The genetics of *Gossypium* and its application to cotton breeding.
Indian Cent. Cott. Comm., 1st Conf. Sci. Res. Wkrs Cott. India, Bombay
(1937) 1938 : 296-312.

This paper is an attempt to summarize the genetical knowledge of the genus *Gossypium* which might be of use to the plant breeder. A list of the known genetic factors in Asiatic and New World cottons is given, together with some notes on correlation and the inheritance of quantitative characters. The inheritance of resistance to *Fusarium* wilt is dealt with, and a multiple factor theory is put forward which is capable of explaining the apparently simple genetical segregations observed in some crosses, as well as the more complicated results obtained elsewhere.

A list is given of fertile and sterile interspecific crosses in the genus, and the usefulness of the back-cross method for getting a few specific genes over from one species to another is emphasized.

588. 633.51:575(54)
Summary proceedings of the thirty-seventh meeting of the Indian Central Cotton Committee, Bombay, held on the 12th and 13th July, 1938 : Pp. 59.

Brief progress reports are given on the cotton breeding and other research schemes sanctioned by the Indian Central Cotton Committee.

589. RAMANATHA AYYAR, V. 633.51:575(54)
Some aspects of cotton breeding work in India.
Indian Cent. Cott. Comm., 1st Conf. Sci. Res. Wkrs Cott. India, Bombay
(1937) 1938 : 328-40.

In view of the apparent impossibility of combining greater staple length with higher yield in Asiatic cottons, the desirability of making fresh attempts to obtain American cottons adapted to Indian conditions is discussed. It is suggested that an exhaustive collection of cultivated and wild American strains should be assembled with this end in view.

Certain difficulties in the technique of cotton breeding are discussed, particularly the question of the optimum level of soil fertility of plots used for plant breeding work.

The presentation of the paper was followed by a discussion which is printed in full.

590

MAHTA, D. N.

633.51:575(54.3)
633.51-2.484-1.521.6:575**Cotton breeding in the Central Provinces and Berar.**Indian Cent. Cott. Comm., 1st Conf. Sci. Res. Wkrs Cott. India, Bombay
(1937) 1938 : 401-10.

The "Oomras" cotton grown in the Central Provinces and Berar until recently was of very coarse, short staple, and was susceptible to *Fusarium* wilt. Breeding for improvement in these characters has been in progress since 1923. The best type of *neglectum* cotton, *G. neglectum* var. *verum* had previously been considered to be wilt-susceptible, but it has been shown that *verum* strains may be produced by crossing *G. indicum* and *G. cernuum*, and that such strains show considerable wilt resistance inherited from the *G. cernuum* parent. The strain Verum 262 was developed from such material, and had a ginning percentage of 32 and a capacity to spin 20's and 22's of Oomras cotton. This strain was wilt-resistant, and was grown on 96,000 acres in 1935. It was, however, a rather unreliable cropper. Certain other strains have since been developed, of which V.434 is especially notable. It is wilt and drought-resistant, has good ginning percentage and spins 32's to 37's. It has strong, silky fibre nearly one inch in length, and is the best all-round type at present available. Some breeding work has also been done on buri cotton (*G. hirsutum*). Three improved strains have been produced, which have very high potential yields. Selection of bani cotton (*G. indicum*) has also been successful, but the low ginning percentage of this cotton is a great disadvantage. A pure white-linted form of Chanda Jari cotton, a *G. indicum* form which previously contained an admixture of plants with tinged lint, has been evolved. The tinged character is due to a single gene which is practically recessive, the heterozygote being easily mistaken for white.

591.

THADANI, K. I.

633.51:575(54.7)

Breeding of improved strains of cotton suited to local conditions with particular reference to Sind and their extension.Indian Cent. Cott. Comm., 1st Conf. Sci. Res. Wkrs Cott. India, Bombay
(1937) 1938 : 380-92.

Breeding of improved cotton varieties in Sind has been conducted along three lines, (1) the improvement of the local short-staple Sind desi cottons, (2) the production of locally-adapted strains of American Upland cotton, and (3) the production of adapted long-staple cottons of the Sea Island and Egyptian groups. Descriptions of the new strains produced are given. Considerable improvement has been effected in the local cotton, but as the area under cotton in Sind is rapidly expanding, and there is only a limited market for Sind desi cotton, more attention is being turned to the other types. Two improved strains of American Upland cottons, Sind 4F-98 and Sind Sudhar 288F-1 are very widely grown. They show considerable resistance to jassid attack and red leaf disease, and are well adapted for cultivation in the Barrage areas on the right and left bank of the Indus respectively. Certain new hybrids, notably Hybrid 101 and Hybrid 94, have been evolved from the cross Sind 4F-18 x Meade Upland, which are very early maturing, and should be valuable in the non-Barrage tracts where water supply is short. Other later-maturing hybrids which may partly replace Sind Sudhar cotton have also been obtained from the same cross.

The improved strains of Sea Island and Egyptian cotton which have been produced, though much better adapted to Sind conditions than other forms of the same groups, still suffer from the disadvantages of late maturity, not very high yield, and unreliability in bad seasons or soil conditions.

The method used for the multiplication of pure seed stocks is outlined.

592.

SAWHNEY, K.

633.51:575(54.9)

Cotton problems of Hyderabad State.Indian Cent. Cott. Comm., 1st Conf. Sci. Res. Wkrs Cott. India, Bombay
(1937) 1938 : 263-78.

The problem of cotton breeding in Hyderabad is a particularly difficult one, since the crop is grown in two separate seasons and in widely differing conditions of soil and climate. In

the north-western and north-eastern portions of the state, a mixture of short-stapled cottons which is predominantly *Gossypium neglectum* var. *rosea* is grown. Little selection work on this mixture has been effected, but two new strains (Havri 3, a strain of *rosea*, and Gaorani 12, an *indicum* strain) have so far been developed. Havri 3 is equal to or a little better than the local mixture in yield and ginning percentage. Gaorani 12 is better in spinning quality but lower in yield.

In the central portion of the state, Gaorani cotton, a medium stapled mixture consisting chiefly of *indicum* and *hiradum* forms, is grown. This mixture has low yield, low ginning percentage and small bolls. A number of improved strains have been isolated, and Gaorani 4 and Gaorani 6 have been selected for further testing. Gaorani 4 has high yield, improved ginning outturn and satisfactory spinning qualities, but matures about ten days later than the local mixture. Gaorani 6 yields higher than the local mixture, though not as high as Gaorani 4, has a still better ginning percentage, and is of improved spinning quality. It matures about ten days earlier than the local mixture.

Practically no selection work has been done in other parts of the state, but the problems to be confronted are outlined in this paper. One of the difficulties at present is that no satisfactory system exists for the production of seed of new varieties on a large scale.

Fusarium wilt exists in the state, though it is not yet very important. Preliminary selection for wilt resistance is being conducted.

593.

BROWN, C. H.

633.51:575(62)

633.51-2.484-1.521.6

The near future of Egyptian cotton varieties.

XVIII Int. Cott. Congr. Egypt, 1938 : 178-80.

FAHMY, T.

The economic aspects of cotton wilt.

XVIII Int. Cott. Congr. Egypt 1938 : 190-91.

FOUAD ABAZA, H. E.

The Sakel substitutes.

XVIII Int. Cott. Congr. Egypt 1938 : 242-44.

These three papers summarize the cotton variety position in Egypt to-day and give an indication of present trends in Egyptian cotton breeding.

The high quality but wilt-susceptible and low yielding variety Sakel has now largely been replaced by wilt-resistant, high yielding cottons of very much poorer quality, notably Ashmouni and Giza 7. The former is the poorest quality Egyptian cotton, but now forms 67 per cent of the total production of the country. Sakha 4, a wilt-resistant variety resembling Sakel but with rather weaker staple and late maturity, has failed to arrest the decline in the cultivation of long staple cottons. Giza 26, first introduced in 1936, is superior to Sakel in quality and gives slightly higher yields, but is wilt-susceptible and rather late in maturing. Wilt-immune selections from it have been inferior in other respects.

Giza 29, bred from the cross Sakha 3 x Maarad, is a very promising new variety now being propagated on a large scale. It is equal to Sakel in quality and to Giza 7 in yield, and should replace these varieties and also Sakha 4. It is at present not fixed for wilt resistance, but wilt-immune selections have been made and appear to be equal to the parent variety in other respects.

Several new strains of high yielding, shorter stapled cottons are being tested by the Ministry of Agriculture as possible substitutes for Ashmouni.

594.

FOUAD ABAZA, H. E.

633.51:575(62)

633.51 Bahtim Abiad

The development of "Bahtim Abiad"—a new white cotton.

XVIII Int. Cott. Congr. Egypt 1938 : 245-47.

A further description of the new Egyptian cotton variety Bahtim Abiad (Cf. "Plant Breeding Abstracts", Vol. IX, Abst. 318).

595. SCHOUTEN, S. A. 633.51:575(72.97)
A memorandum on the Central Cotton Breeding Station at Montserrat, B.W.I.
 Rep. 3rd Ord. Gen. Mtg W. Indian Sea Island Cott. Ass. (Incorp.), Trin.
 1938 : 21-22.

The function and organization of the Montserrat cotton station are described. In 1938, the work of selecting, testing in progeny rows and multiplying improved lines of the "Montserrat strain" of Sea Island cotton has proceeded as before (Cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 1047) except that the testing plots are now laid out in such a way as to make possible an accurate statistical determination of differences between lines.

596. RAMIAH, K. and
 PANSE, V. G. 633.51:575:578.08
A reply to Dr. Mason's note on cotton breeding technique.
 Emp. Cott. Gr. Rev. 1939 : 16 : 25-30.

The authors disagree with some of the conclusions of Mason (Cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 1042) with regard to methods of cotton breeding. It is shown that secondary selection has considerable value, especially when progeny rows are replicated in order to give a more sensitive test of yielding ability.

Dr. Mason's ideas on acclimatization, on the induction of variability by growing strains in new environment and on the use of hybridization in breeding, are also criticized.

The authors consider that there might be cases where a controlled mixture of types will out-yield any of the components, and experiments on mixtures are in progress.

597. TEMPLETON, F. 633.51:575:578.08(62)
Production and control of cotton varieties.
 XVIII Int. Cott. Congr. Egypt 1938 : 175-77.

A brief, non-technical description of the methods used by the Egyptian Ministry of Agriculture in breeding cotton and in maintaining pure stocks of cotton seed.

598. HUTCHINSON, J. B. 633.51:575:677.1(72.9)
The place of spinning tests in the control of West Indian Sea Island cotton.
 Rep. 3rd Ord. Gen. Mtg W. Indian Sea Island Cott. Ass. (Incorp.), Trin.
 1938 : p. 26.

Spinning tests were carried out in 1938 on cotton from the multiplication fields throughout the Leeward Islands and St. Vincent, and from the field crops of St. Vincent and Montserrat. It is concluded that there is little scope for improvement of the fibre characteristics of Sea Island cotton except in evenness of maturity, a character which affects "neppiness" in spinning. Most of the future work of the plant breeder will be devoted to improvement in yield and other agricultural characteristics rather than quality. Tests of Red Sea Island cotton in St. Vincent showed that it is far short of superfine standards in hair weight and spinning value, and more selection will be necessary. The VH strains derived from V.135 x M.S.I. hybrids are promising and a considerable improvement on the M.S.I. strain acclimatized in St. Vincent.

599. AHMAD, N. 633.51:576.16(54)
 633.51:677.1:581.6
Technological reports on standard Indian cottons, 1938.
 Technol. Bull. Indian Cott. Comm. 1938 : Ser. A : No. 45 : Pp. 104.

The following data are given for each of the important varieties of cotton grown in India: history, district where grown, climatic requirements, morphological characteristics, yields, area under cultivation, grader's report, details of spinning tests, and certain other remarks.

600. PATEL, S. J. 633.51:578.08:575
Advantages and disadvantages of the back-cross method in plant breeding.
 Indian Cent. Cott. Comm., 1st Sci. Res. Wkrs Cott. India, Bombay (1937)
 1938 : 341-46.

The utility of the back-cross method with particular reference to cotton breeding is discussed. It is concluded that the method is of considerable value for wide crosses.

601. ABRAHAM, P. and RAMANATHA AYYAR, V. 633.51:581.46:582
Floral anatomy as an aid to the classification of cottons.
 Indian Cent. Cott. Comm., 1st Conf. Sci. Res. Wkrs Cott. India, Bombay
 (1937) 1938 : 369-79.

The vascular anatomy of the flower, and especially of the gynaecium, in some of the wild and cultivated cottons of the Old and New World groups is described in detail. The value of this character in the classification of the genus is discussed.

602. PANSE, V. G. 633.51-1.421
The delimitation of areas for strains of agricultural crops, with special reference to cotton.
 Indian Cent. Cott. Comm., 1st Conf. Sci. Res. Wkrs Cott. India, Bombay
 (1937) 1938 : 411-23.

The importance of adequate testing of new varieties in the districts and under the cultural conditions for which they are finally intended is stressed. It is suggested that after preliminary testing has been carried out at experiment stations, the most promising varieties should be tested in simple trials actually on the cultivators' lands, in as many different places as possible, scattered throughout the region. These trials, in addition to their value in the testing of new forms, are also of value as demonstration plots for the cultivators. The statistical aspect of such trials is discussed.

603. UPPAL, B. N. 633.51-2.484-1.521.6:575(54.7)
Breeding for wilt resistance in cotton.
 Indian Cent. Cott. Comm., 1st Conf. Sci. Res. Wkrs Cott. India, Bombay
 (1937) 1938 : 279-95, 313-27.

Cotton breeding for the selection of types resistant to *Fusarium* wilt is very difficult in the field, as the incidence of the disease is so strongly affected by uncontrolled environmental conditions. Facilities exist at Poona for the testing of *Fusarium* wilt-resistance under optimum conditions of infection, and several highly resistant strains have already been obtained. The breeding technique adopted is described in detail.

Wilt resistant strains of Broach Desi 8, N.S.12 and Million Dollar cottons are in process of selection.

When sufficiently resistant selections have been obtained at Poona, they will be subjected to final testing and selection in the field in the various areas for which the strains are intended.

It appears that wilt resistance in Indian cottons has a complex genetic basis, probably being due to a number of cumulative factors.

In the discussion which followed the presentation of the above paper, the speakers were generally agreed that the selection of cotton strains completely immune to *Fusarium* wilt under optimum conditions of infection was the ideal to aim at, but doubt was expressed by some workers as to whether it was the most desirable immediate practical objective. Rejection of susceptible plants at Poona was so rigorous that quite probably the plants with the most desirable agronomic characters would be discarded.

Complete immunity is not imperative in practice, and selection for other agronomic characters should not be subordinated to it. It was a general view that a strain which showed 95 per cent resistance in the field, coupled with other desirable characters, would be sufficiently good in practice, providing that it was homozygous for that degree of resistance.

604. PARNELL, F. R. 633.51-2.7-1.521.6:575
Plant breeding and cotton insect pests.
 Rep. and Summary Proc. 3rd Conf. Cott. Gr. Prob., Emp. Cott. Gr. Corp.
 1938 : 81-85.

The general aspects of the problem of controlling insect damage to cotton crops by plant breeding methods are discussed. If the attack of a particular insect develops regularly at a certain time in the season, it is often possible to breed varieties that escape disease as they have either passed or not yet reached the susceptible stage at the time of the attack. Another method particularly applicable in the case of pests which attack the crop at different times in different years, is to breed varieties which fruit steadily over a long period, so that a comparatively small proportion of the total crop will be affected.

The development of varieties with true resistance to insect attack has been possible in some cases. This is true in the case of jassid and in the case of the insect vector of leaf curl in the Sudan. It may also be possible in the case of *Helopeltis* and *Lygus*, as it has been reported by Gwynn that different varieties show marked differences in susceptibility to both of these pests. In the testing of varieties for resistance to insect attack, very great caution must be used. A difficulty arises because many insect pests will attack particular varieties in a trial plot because they prefer them, the remaining varieties therefore showing an apparent resistance to the pest. If these apparently resistant varieties are planted by themselves, not in close proximity to varieties preferred by the insect, they are often attacked just as severely as any. They are not truly resistant, but merely escape damage in the trial plots.

In work of this kind, it is very essential that the plant breeder should have the full co-operation of an entomologist.

The paper was followed by a discussion.

605. BALLS, W. L. 633.51:677.1:578.087
A rapid test for the strength of cotton.
 XVIII Int. Cott. Congr. Egypt 1938 : 167-72.

A preliminary account of a new device designed for testing the strength of cotton fibres by the impact test.

SUGAR PLANTS 633.6

606. BAISSAC, J. 633.61:575
Espèces, variétés, sports de cannes. (Species, varieties, sports of canes).
 Rev. Agric. Maurice 1938 : No. 102 : 176-83.

A brief and general account of the genetics of sugar cane with regard to species, varieties and mutations, pointing out the difficulties and stressing the need for further researches.

607. CRAIG, N. 633.61:575(69.82)
Part I. Cane-breeding.
 8th Annu. Rep. Sugarcane Res. Sta., Dep. Agric. Mauritius (1937) 1938 :
 6-32.

The work of the Station has continued on much the same lines as in previous years (Cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 351).

A list is given of the crosses made in 1937. In addition to combinations previously used, a number of new combinations were tried for the first time; in particular, two seedlings produced at the station, M.134/32 and M.188/33 were used experimentally as parents.

Details are given of the performance of the canes recently released by the Station. M.171/30 is in particularly high demand, but M.73/31 has not proved so popular, probably owing to its growth habit and apparent susceptibility to borer attack and red rot; it is to be tested on *Phytalus*-infested land. M.72/31 has been very satisfactory, proving better than M.171/30 in some trials—it does not appear to be susceptible to borer attack and has a good growth habit and very healthy appearance. Its sucrose content is higher than that of M.171/30. Clone M.108/30, released on the ground of *Phytalus* resistance has proved to be disappointing in sucrose content and purity of juice. A further variety, M.134/32 has now been released for general distribution.

Descriptions are given of the various preliminary trials of seedlings conducted during the year. Three more selections have been selected for field trial. Tables are given to show the performance of the best released varieties in field trials, more of which have been started during the year, both on estates and at the Experiment Stations.

The search for canes of high quality which are able to withstand heavy *Phytalus* infestations is being continued. The varieties M.108/30, M.167/32 and M.168/32 at present being tested all have a rather low sucrose content.

Variety trials have been instituted in certain regions where very low quality canes of the Uba de Rich Fund type are at present grown.

608. 633.61:575(94.3)

Bureau of Sugar Experiment Stations. Field day at Mackay.

Aust. Sug. J. 1938 : 30 : 354-58.

Three new varieties of sugar cane tested at the Mackay Experiment Station have proved to be superior in yield to the standard, Q.813, but two of them, C.83 and C.85, had to be discarded because of disease susceptibility. The other, Q.20, will probably be released next year. In addition to high yield it had the highest c.c.s. at the station, 18.8.

609. 633.61:575.127.5:633.289(54.8)

Sugarcane x bamboo hybrids. (Short note on history and present position). Pp. 6.

Private publication. (Mimeographed).

Hybrids between the sugar cane variety P.O.J.213 and *Bambusa arundinacea* were first obtained at Coimbatore in 1936. In spite of the distant taxonomic relationship of the two parents, the F_1 plants produced an abundance of pollen and set seed freely. An F_2 is now being raised, and it is considered that types of sugar cane with increased growth vigour and other desirable characteristics may be derived from the cross.

610. 633.61:575.127.5:633.289:578.08

Technique of sugarcane x bamboo pollination.

Curr. Sci. 1938 : 7 : p. 232.

Pollination of sugarcane with bamboo pollen has until now been very difficult, since the flowering bamboo plants had usually to be sought in dense and not easily accessible forests. If a flowering bamboo plant is cut to the ground, it will subsequently produce, under favourable conditions, a mass of shoots, most of which bear inflorescences. It is pointed out that these shoots may be collected and planted at the plant breeding station, where flowering may take place for periods as long as three months.

611. 633.61-2.7-1.521.6:575(94.3)

633.61:575:578.08

633.61Q2

Thirty-eighth annual report of the Bureau of Sugar Experiment Stations. Report of the Director to the Hon. the Secretary for Agriculture and Stock.

Brisbane 1938 : Pp. 58.

A list is given of the crosses made in the 1938 season. New varieties are being selected for increased hardness of rind and stronger rooting systems, to give greater resistance to beetle borer and cane grub damage. New varieties so produced will necessarily have a higher fibre content. They will be more suitable for standing over for harvesting as a two-year crop should this be necessary.

Most crosses were made with the female arrow in the field, and the cut male arrows in 0.01 per cent SO_2 or H_3PO_4 solution.

Crosses between Co.290, which has high Fiji disease resistance, and P.O.J.2878, have given some promising seedlings.

In the past, 10-sett plots of seedlings have been planted for testing purposes. Such 10-sett plots only served for the detection of differences in yield of 40 per cent or more, and it has now been decided to use 40-sett plots of four rows of 10-setts each.

The Q2 seedling has been released for commercial planting, and is now planted over a considerable area. It is of erect habit, is free trashing and resistant to beetle borer attack and flood damage. It has a medium to good sugar content and crops well under satisfactory moisture conditions. It matures late, and will not ratoon well if cut before mid-September. At the Mackay station the Q.20 variety outyielded the standard, Q.813, and possessed sufficient disease resistance to warrant release for farm trial purposes.

STIMULANTS 633.7

612. KOSTOFF, D. 633.71:575.127.2:576.356.5:576.12
Studies on polyploid plants. XXI. Cytogenetic behaviour of the allopolyploid hybrids *Nicotiana glauca* Grah. x *Nicotiana Langsdorffii* Weinm. and their evolutionary significance.
 J. Genet. 1938 : 37 : 129-209.

Meiosis is described in the parental species, *N. glauca* and *N. Langsdorffii*, in the F_1 hybrids between the two, in various back-cross plants and in crosses of the F_1 to *N. Sanderae*, and in amphidiploids derived from the F_1 .

The original amphidiploid, which arose parthenogenetically, had 51 per cent of viable pollen and set 28 seeds per capsule. It did not breed true, a fairly high proportion of pollen mother cells having one or more trivalents or quadrivalents. In subsequent generations the fertility of the amphidiploids increased, until in F_6 certain plants had 99.5 per cent. good pollen, and by F_5 some of the plants had about 200 seeds per capsule.

Many aneuploid derivatives were obtained from these plants.

It is concluded that inconstant amphidiploids, derived from hybrids in which some chromosome pairing occurs, may be more important from the evolutionary point of view than constant, true-breeding amphidiploids, since they are able to give rise to a series of adaptable forms.

The formation of hereditary, non-parasitic tumours in the F_1 hybrid is described and discussed.

613. TUBBS, F. R. 633.72:575.42(54.8)
Seed supply in relation to supplying and replanting.
 Tea Quart. 1938 : 11 : 160-66.
 TUBBS, F. R.
Some aspects of tea selection.
 Tea Quart. 1938 : 11 : 166-73.

In the first paper, the author's views on tea selection in Ceylon, already summarized in "Plant Breeding Abstracts" (Vol. IX, Abst. 67) are re-stated, together with some recommendations on the culture of seed-bearing bushes.

In the second paper the practical aspects of selection are dealt with in more detail.

In selecting seed-bearers, it is suggested that the pruners should first of all select the two largest bushes in each hundred not adjacent to a vacancy.

By subsequent visual inspection more stringent selection can be made from these trees.

A good habit of growth and the ability to yield well through a comparatively long season are important points in selection.

It is important to select seedlings in the nursery at as late a growth stage as possible, for differences between the seedlings become more pronounced with increasing age. To avoid bias due to differences in vigour of seedlings in different parts of the nursery caused by soil heterogeneity, a fixed proportion of plants should be selected from each small area.

When the seed-at-stake method of planting is adopted, it is suggested that four seeds per hole should be planted; that the plants in each hole should be thinned to two at as late a stage as possible, eliminating the weaker plants, final thinning to one plant per hole only taking place when crowding becomes really serious.

614. KRUG, C. A. 633.73:575.11-181
The Genetics of *Coffea*. Part I. The inheritance of a dwarf type
 —*nana*.
 J. Genet. 1938 : 37 : 41-50.

A dwarf type of coffee occurs in the progeny of *C. arabica* var. *Murta*. It is shown that this is a simple recessive, *na/na*, the *Murta* type being heterozygous, *Na/na*, while the *Bourbon* variety has both dominant genes, *NaNa*.

The relationship between *C. arabica typica* and the variety *Murta* is under investigation. The F_1 plants of this cross are all large-leaved.

The genes *Na* and *na* are relatively unstable, each mutating frequently to its allelomorph.

615. 633.73-1.541:581.165
Quarterly notes of the Coffee Research and Experiment Station,
Lyamungu, Moshi.
 Dep. Agric. Tanganyika 1938 : No. 7 : Pp. 12.

Inter alia, an account is given of the technique employed in the vegetative propagation of selected coffee trees.

616. 633.74:575(66.7)
 633.74:581.162.5
 WRIGHT, J.
The Cocoa Research Station, Tafo. First annual report (1937-1938).
 Bull Dep. Agric. Gold Cst 1938 : No. 36 : Pp. 36.

The Cocoa Research Station established in 1937 at Tafo, Gold Coast, is described and an outline given of the work it is intended to undertake. The botanist will be chiefly concerned with the production of high yielding strains. Preliminary investigations have shown that poor yields of plots of high quality cocoa in the Gold Coast may be due to incompatibility in a large proportion of the trees, and the possibility of producing high-yielding strains of high quality is indicated.

Progeny trials will form an essential part of the work of the station and the degree of susceptibility of new types to disease and insect attack will be carefully tested.

617. 633.79:575(42)
 633.79:576.356.5:581.04
 SALMON, E. S.
Hops.
 J. S.-E. Agric. Coll. Wye 1939 : No. 43 : 24-26.

The breeding of new hop varieties is being continued, and many new seedlings are under test. Crosses have been made between the varieties Canterbury Whitebine, Early Bird, Tolhurst, Brewer's Gold, Bullion Hop, and other varieties and selected male hops. Male plants of the wild hop of America, *Humulus americanus* var. *neo-mexicanus*, have also been used in crosses.

Efforts are being made to produce polyploid hops by treating seed and plants with colchicine. Preliminary experiments of this kind have been carried out, apparently without success.

AROMATIC PLANTS 633.8

618. PAL, B. P. and
 RAMANUJAM, S. 633.84:576.356.5:581.04
Induction of polyploidy in chilli (*Capsicum annuum* L.) by colchicine.
 Nature, Lond. 1939 : 143 : 245-46.

Numerous tetraploid plants were obtained by immersing chilli seeds in colchicine solution of various strengths ranging from 0.05 to 0.4 per cent for periods of from 1 to 8 days. Polyploid plants of a higher order were not observed. Several diploid-tetraploid chimaeras and one triploid plant occurred, though it is not clear whether or not the latter was a result of the colchicine treatment.

The polyploid plants were generally slow growing, developed broad and succulent leaves and had varying percentages of sterile pollen. The fertile pollen was nearly twice as large as that of the diploid plants.

OIL PLANTS 633.85

619. ALI MOHAMMAD, K. S. CH. 633.853.49:575.42(54.5)
A new type of raya (O.B.1).

Seas. Notes Punjab Agric. Dep. 1938 : 18 : 27-31.

A new type of raya (rape), known as type O.B.1 was selected from a mixed population grown at Lyallpur in 1931. In extensive yield tests the variety has been shown to outyield local sarson at various places in the Punjab by an average of 54 per cent. Unlike ordinary forms of sarson and toria, raya O.B.1 is self fertile, and does not depend upon insect pollinators. The variety is resistant to drought and frost, and has a very vigorous and extensive root system. It yields a high tonnage of green fodder, and its value as an oil seed crop is also high.

620. 633.854.54:575(54)
Report on the marketing of linseed in India.
 Agric. Market. India 1938 : Market. Ser. No. 8 : Pp. 352.

This report contains a brief summary of the linseed breeding work in progress in India.

At Pusa it was found that two main types of linseed occur in India; deep-rooted strains with relatively low yields of large seed with a high percentage of oil, best suited to growing in Peninsular India, and types with a shallow and abundant root system and high yield of small seed relatively poor in oil, suited to the Gangetic alluvium. Of the latter, types 12 and 121 were found to be high-yielding and were distributed to growers. Crosses between these two types were made to combine large seeds and high yield, and some of the most promising hybrids are being tried out in the provinces. Crosses between rust resistant and rust susceptible types are also under investigation. There appears to be some correlation between seed colour and oil content, the yellow seeded types having the highest oil content, and the darker type less.

In the Central Provinces, crossing and selection work is being carried out to produce heavy yielding, rust resistant and early maturing types of bold linseed. Crosses between local linseed and rust resistant Pusa varieties are under trial.

In Bihar and Orissa, work is being done on the improvement of the local varieties and also on the production of a wilt-resistant type.

In Bombay, variety trials indicate that local types are the highest yielders, but types from elsewhere may be suitable for hybridization to obtain forms with light-coloured seed.

Five types of pure lines of linseed have been isolated from the Bengal crop. Some of the mixed local varieties have an oil content as high as 42 per cent, and isolation of pure lines from these is being effected.

In the Punjab, 33 pure types have been isolated from mixtures grown in the province. Some of this gave a maximum yield of over 1,800 lb. to the acre and had an oil content of over 48 per cent of the dry seed. Bold and small seeded varieties are being crossed to combine the desirable traits of both kinds. Local bold seeded types are also being crossed with a white seeded hybrid, to obtain an improved strain with lighter coloured seed than the bold variety.

The need for the large-scale distribution of improved linseed to native growers by the agricultural departments is stressed.

621. WEBSTER, C. C. 633.855.34-1.421:519.24.
A note on a uniformity trial with oil palms.
 Trop. Agriculture, Trin. 1939 : 16 : 15-19.

A uniformity trial with oil palms designed to determine the best type of experimental design for trials with this crop, is described.

It is concluded that under the conditions of the trial there would be little point in increasing the plot size above 32 palms, the useful range appearing to be 16 to 32 palms.

Half acre plots replicated six times might be expected to demonstrate significant differences of 20 per cent between treatments on the basis of a single season's yields; 15 per cent if the average of two season's yields are used, and 10 to 12 per cent if the present season's yields

are corrected by means of a regression function determined from the three previous years' yields.

The markedly biennial bearing habit of many of the trees has to be taken into account in evaluating any experimental results.

MEDICINAL PLANTS 633.88

622. MCAULAY, A. L. 633.88.11.871:575.127.2
Evidence for the existence of a natural hybrid between *Eucalyptus globulus* and *Eucalyptus ovata*.

Pap. Proc. Roy. Soc. Tasm. (1937) 1938 : 45-46.

In the course of an investigation at Bagdad, Tasmania, on suspected hybrids of *E. globulus* and *E. viminalis*, a tree was found which is believed to be a hybrid of *E. globulus* and *E. ovata*. About 50 seedlings have been raised; and they range from a type hardly distinguishable from *E. globulus* to a type indistinguishable from *E. ovata*.

The fruits of the putative parent species and the hybrid are illustrated.

623. MCAULAY, A. L. and CRUICKSHANK, F. D. 633.88.11.871:576.354.4
The male meiotic cycle in the genus *Eucalyptus*.

Pap. Proc. Roy. Soc. Tasm. (1937) 1938 : 41-44.

A study of the course of meiosis in pollen mother cells of *E. globulus*, *E. Johnstoni*, *E. linearis*, *E. pauciflora*, *E. viminalis*, *E. obliqua*, *E. salicifolia* and *E. cordata*, which are taken as fairly representative of the main types of Tasmanian eucalypts, is reported. In each of these species the haploid chromosome number proved to be 11.

The process of meiosis was of the type associated with a vesicular nucleus. The second prophase, which appeared to follow an unusual course, is described in detail.

Some evidence of secondary pairing was observed at metaphase I and anaphase I in *E. globulus*. It is hoped to study the chromosome configurations and chiasmata at some future time.

RUBBER PLANTS 633.91

624. MANN, C. E. T. 633.912:575:581.163:631.531.1(91)
Recommendations on the choice of planting material, clones and clonal seedlings.

3rd Quart. Circ. Ceylon Rubb. Res. Scheme 1938 : 15 : 123-32.

It is pointed out that, at present, considerable caution must be exercised by planters in using "clonal" seedlings (plants grown from seed collected from clones known to be of superior performance), instead of budded plants of the clones themselves, in replanting rubber estates. Certain artificial hybrids between clones have shown considerable promise in preliminary tests and details are given of some such crosses, but in general, it is too early to judge whether they are good enough to replace the best clones.

It was concluded at first that it would not be possible to produce commercial quantities of hybrid seed by hand pollination, but on certain Java estates large gangs of coolies have been trained to do the pollination work, with considerable success. An alternative method of producing "clonal" seedlings is to make isolated plantings of selected clones and to allow natural inter-pollination to take place.

Where two such clones are interplanted, it is likely that most of the seed produced will be of hybrid origin and small experimental plantings of this kind can be recommended.

FRUIT TREES 634

625. LAL SINGH, S. S. S. 634:575.42(54.5)
A plea for starting bud selection work.

Seas. Notes Punjab Agric. Dep. 1938 : 18 : 20-22.

The work of bud selection societies in various parts of the world is referred to, and it is pointed out that very considerable improvement in fruit crops in the Punjab may be effected if the bud wood used for propagation is selected only from the best parent trees.

626. LEWIS, D. and
CRANE, M. B.

634.11:575.061.6:575.127.2

Genetical studies in apples. II.

J. Genet. 1938 : 37 : 119-28.

The inheritance of purple anthocyanin plant colour in the cross *Malus Niedzwetzkyana* x *M. Malus* is described. The former species carries a single dominant gene for purple pigmentation. Great variation was found in intensity of pigmentation of the purple plants, which was attributed to the action of modifying factors.

The percentage of scorable plants in the progenies was increased from 56 to 99 by removing the testa and nucellar tissue from the seeds. This treatment did not affect the genetic ratios for purple colour.

- 627.

634.23:581.162.5:581.331.23:577.17

ROY, B.

634.22:575.127.2

Studies on pollen tube growth in *Prunus*.

J. Pomol. 1939 : 16 : 320-28.

Treatment of the styles of the self-incompatible cherry, Noir de Schmidt, with phenylacetic acid did not increase the rate of pollen tube growth or affect the development of fruit following self-pollination. Naphtholacetic and indolylacetic acid treatments were equally ineffective. Studies were also made of the behaviour of pollen in the styles of the self-incompatible plum Coe's Golden Drop.

The cross *Prunus divaricata* (diploid) x *P. domestica* (hexaploid) set 6 per cent of fruit, while the reciprocal cross set 15 per cent. The growth rate of diploid pollen tubes in a hexaploid style was found to be much more rapid than that of hexaploid pollen tubes in a diploid style.

CITRUS FRUITS 634.3

628. ARGLES, G. K.

634.337:575.42:581.165(72.92)

The selection and propagation of limes.

J. Jamaica Agric. Soc. 1938 : 42 : 471-78.

Attention is called to the great amount of variation at present existing in the lime, which has been cultivated until recently in Jamaica as a wild tree crop. It is very desirable that new planting material should be propagated clonally from selected mother trees. It is suggested that selection should be based on the following characters: large fruit of good shape and quality, vigorous trees of upright habit of growth, freedom from disease and a minimum amount of spininess. The production of larger fruits is of particular importance if the foreign market for limes is to expand.

Propagation methods are discussed. Budding on to sour orange stocks is not yet recommended, as little is known about the compatibility of stock and scion. The two remaining methods are propagation by seed and by cuttings. The lime is polyembryonic, supernumerary embryos being vegetative in origin. Seed sowing is a suitable method of vegetative propagation if care is taken to rogue out the sexual embryos in the seedbed and nursery. The alternative method of propagation by cuttings gives rather more rapid establishment of trees, but is a rather difficult procedure.

PALMACEOUS AND OTHER FRUITS 634.6

- 629.

634.61:575.42(95)

DWYER, R. E. P.

634.61:575

Coco-nut improvement by seed selection and plant breeding.

New Guinea Agric. Gaz. 1938 : 4 : 24-102.

In this paper the problems of coconut breeding and coconut selection are dealt with at length, with a discussion of the relevant literature.

Current practices of the natives and planters of New Guinea with regard to coconut seed selection are outlined; in general any selection practised is of a crude kind, consisting most often of selection from piles of harvested nuts from unknown mother trees. In view of the high variability of the populations of palms in plantations, the need for a more scientific system of selection is stressed. It is suggested that potential mother trees should be marked and their behaviour observed for a number of years before selections are finally made.

Desirable characteristics to look for when selecting and various genetic abnormalities to avoid are detailed. A proper system of mother tree selection should be accompanied by rigid exclusion of weak or otherwise undesirable seedlings from the nursery, and by further selection after the palms have been planted out. Yield increases of the order of 20 per cent may be looked for when proper selection is practised, and it is pointed out that as the palm is a very long-lived plant, the initial cost of selection will thereby be repaid many times.

The questions of regional strains of coconut palm, and of the desirability of introducing such strains, are discussed. The floral morphology and the methods of natural and artificial pollination of the crop are also dealt with.

With regard to coconut breeding, as distinct from selection, very little is known. Experiments are rendered difficult by the great height of the palms and the consequent difficulty of controlled pollination on a large scale. The long interval between generations is a further major difficulty. The practicability of various suggested methods of coconut breeding in New Guinea is discussed. It is suggested that a system of "close-breeding" would be the most practicable means of improvement.

Seedlings derived from individual mother trees would be planted in compact blocks, so that trees in the centre of each block would almost certainly be pollinated by other trees of the same family. Nuts from the centre of the best plots would be used as seed material for the next generation, and selection along the same lines could be repeated for as many generations as necessary. In the later stages, the plots would be arranged in the form of a yield trial. Such a method of coconut breeding is at present being used on a small scale at the Keravat Demonstration Plantation near Rabaul.

A bibliography of 68 references is appended.

FORESTRY 634.9

630.

PETO, F. H.

634.972.3:576.356:581.331.2

634.972.3:575.127.2

Cytology of poplar species and natural hybrids.

Canad. J. Res. 1938 : 16 : Sect. C : 445-55.

The native American aspen species *Populus grandidentata* and *P. tremuloides* both regularly formed 19 bivalents. No definite heteromorphic sex-determining pair could be observed. In both species the percentage of good pollen was high, but the variation in pollen size considerable. Giant pollen grains, which may have been diploid, were present.

P. eugenei, a hybrid form originating in France, was diploid ($2n = 38$), but showed a considerable amount of asynapsis, only 68 per cent good pollen, and a very high range in pollen size, irregularities presumably due to its hybrid nature.

Two male trees of *P. alba* were examined, and both proved to be triploid ($2n = 57$). In one of these trees, *A2*, the mean number of trivalents per pollen mother cell was 13.25, whereas in the other, *A1*, it was only 5.8. This suggests that *A2* is an autotriploid, while *A1* may be of hybrid origin. In each case, the percentage of good pollen was surprisingly high for a triploid, being 94 and 83 per cent respectively.

Two of the *P. canescens* trees examined were triploids, while two others were diploid.

One of the triploids showed a fairly high degree of chromosome conjugation, but the other (*C5*) showed 0 to 7 bivalents per nucleus, with a mean of 2.7. It is concluded that this high degree of asynapsis is due to the presence of genetic factors limiting pairing. In spite of such a high degree of failure of synapsis, this tree showed 96 per cent good pollen.

Twelve natural hybrids of *P. alba* x *P. grandidentata* were all diploids, the mean number of bivalents being 17 to 19 in ten of the trees. It is therefore concluded that a high degree of homology exists between the chromosomes of these two species. The other two plants, *AG 10* and *AG 36*, showed averages of $10.9_{II} + 16.2_I$ and $1.8_{II} + 34.4_I$ respectively. It seems that genetic factors limiting pairing must be present here again. *AG 36*, with almost complete asynapsis, showed 86 per cent apparently normal pollen.

Three trees of *P. alba* x *P. tremuloides* were all diploids, with averages of 18.1, 18.8 and 16.4 bivalents per nucleus.

The most unusual feature of these species and hybrids is the high percentage of normal pollen produced by triploid and asynaptic plants. It is suggested that this is due to the abortion

of unbalanced pollen grains at a very early stage, so that their remains are not recognizable as pollen grains at maturity. Examination of pollen size and fertility is of no value for distinguishing triploids from diploids in these species.

VEGETABLES 635

631. PARK, M. and
FERNANDO, M. 635.64-2.3-1.521.6(54.8)
The relative resistance of some tomato varieties to bacterial wilt.
(*Bacterium solanacearum* E.F.S.).
Trop. Agriculturist 1938 : 91 : 333-37.

Eight varieties of tomato were compared to determine their resistance to bacterial wilt under natural conditions of infection in Ceylon. The varieties Marvana, Red Marhio 2 and Marglobe proved to be significantly more resistant than the other varieties tested (Red Marhio 1, Pritchard, Break O'Day 1 and 2 and one local variety).

632. ADLER, E. 635.655:575(68)
635.654:575(68)
New soybean and cowpea varieties. Promising results of Natal tests.
Fmr's Wkly 1939 : 56 : p. 1371.

An account is given of field trials with two new selections of non-shattering soya beans, Nos 51 and 395, and one of upright cowpeas, No. 361 bred by Dr A. R. Saunders at Potchefstroom, South Africa.

Part II. Foreign.

STATISTICS 519

633. CLARK, A. and LEONARD, W. H. 519.24
The analysis of variance with special reference to data expressed as percentages.

J. Amer. Soc. Agron. 1939 : 31 : 55-66.

Attention is called to a method of transformation of the original variables in the case of discrete data, such as percentages, in order that the methods of analysis of variance, including the use of generalized standard error, may be applicable. The need is further emphasized for subjecting data to a test for homogeneity of estimated variances, and this point is illustrated by means of an example. J. W.

634. BETREM, J. G. 519.24:581.4:633.73
 Hoe de in proeven verkregen cijfers bewerkt worden en wat de resultaten beteekenen. (**How the figures obtained in experiments are treated and what the results signify**).
 Bergcultures 1938 : 12 : 1702-14.

The author illustrates the nature of variation in this experimental material, and shows how to form frequency distributions, and how to calculate the constants of those distributions. The paper is expository of elementary statistical methods, as exemplified by application to the determination of the leaf index and bean length in coffee clones. J. W.

635. TELEGDY KOVÁTS, L. von 519.24:634.22
 Matematikai módszerek a tudományos kutatás szolgálatában. 4. Student "t" és Fisher "z" próbájának gyakorlati alkalmazása szilvaelemzési adatokon. (**Mathematical methods used in scientific research. 4. Practical application of Student's t-test and Fisher's z-test to the results of plum analyses**).
 Mezőgazdas. Kutatás. 1938 : 11 : 229-35.

The use of Fisher's z-test and Student's t-test in determining whether or not differences between different plum varieties based on a small number of determinations are significant, is described and illustrated.

BREEDING 575

636. 575:633(47)
 (**The activities of the Kinel'skaja Breeding Station**).
 Seleksija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 10 : p. 38.

A brief note on the programme of the station in regard to breeding cereals, grasses and forage crops as well as seed production. The aims in cereal breeding are high yield combined with drought and disease resistance. Among the varieties that have been produced by this Station are: the spring wheats, Hordeiforme 01404, Albocaesium 06593 and Lutescens 01260; the barleys, Nos 012, 0263 and 0264, the soya bean, No. 090 and the vetches, Nos B-7 and B-10—all of which are now included in the official variety trials.

637. 575:633(47)
 (**Upon what work is the Gorskaja Official Breeding Station engaged?**)
 Seleksija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 10 : p. 38.

This station is dealing with the problem of improving the quality and yield of cereals and other crops. The greatest success has been obtained with maize—a white dent hybrid and other strains. Over 40 varieties are undergoing preliminary multiplication and of these 12 have

been included in the official variety trials. In addition to valuable hybrid forms, inbred lines have been obtained which in the 3rd-6th generation have surpassed the best recognized varieties in yield. Rust resistant wheats have also been produced and potato breeding has given good results.

Sunflower and artichoke hybrids have given high yields of both tubers and tops.

638.

BOLOBAN, S. M.

(Methods of producing élites).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1938 : Nos 8-9 : 17-18.

575:633:581.162.32

633.14-1.531.12

Using the example of rye a scheme of creating élites of cross-pollinating plants is described, based on the selection of typical ears and of their best grains, followed by discarding of any progenies of insufficient winter-hardiness, vigour and disease resistance. The progeny of each ear was planted separately, under conditions of wide spacing and careful tending.

639.

CHARLES, D. R. and

SMITH, H. H.

Distinguishing between two types of gene action in quantitative inheritance.

Genetics 1939 : 24 : 34-48.

575-18:519.24

A number of statistical relationships are given which should hold, within the limits of sampling error, in various generations of a quantitative character cross (*a*) if the genes concerned have arithmetic effects with partial dominance and (*b*) if the genes have geometric effects. These criteria can be used to determine, in any particular cross, which hypothetical type of gene action more nearly fits the observed facts.

GENETICS 575.1

640.

OEHLKERS, F.

Vererbung. A. Allgemeine Vererbungslehre. B. Spezielle Vererbungslehre. (Inheritance. A. Genetics—general. B. Genetics—special).

Fortschr. Bot. Berl. 1938 : 7 : 293-312.

575.1

575

The results of recent work on the problems of heterosis, genom analysis, labile genes, the action of the plasma in inheritance, mutation and evolution are reviewed. For earlier reviews see "Plant Breeding Abstracts", VIII, Abst. 1096.

641.

MASING, R. A.

[Methods of studying the inheritance of quantitative characters. (In self-pollinating plants)].

Bull. Acad. Sci. U.R.S.S., Sér. Biol. 1938 : 427-54.

575.11-18:578.08

633.11:575.113.4-18:581.46

The author, in discussing the methods of T. K. Lepin, concludes that with the large number of segregating factors operative it is not justifiable to draw conclusions from the small number of F_2 and F_3 plants used by that author. Examinations were made of an F_2 of the cross Marquis x Aurora left by Philiptschenko and consisting of 163 plants. Data are given on the length of grain in 40 F_3 families and show an almost unbroken series from the lowest to the highest values; both in F_2 and F_3 the limits of variation transgressed those of the parents. Some of the extreme families were taken into F_4 , where further segregation occurred, showing the inadequacy of taking a sample of only 2-4 plants as done by Lepin. Families with longer grain than any found in the F_3 were observed, but not with shorter; and still higher grain lengths were found in certain F_5 families. It is clear that neither of the two parents represents the extremes of the series.

The author proposes a more suitable method than that of analysing the F_2 and later generations in full; it is, for crosses differing in a large number of factors, to back-cross with

one of the parents, which increases the chances of recovering the parental type, the proportion of which indicates the number of factors in play. When the parents differ in a small number of factors, it is recommended that a large F_2 should be examined and the progeny of the extreme variants taken as "analysers" for crossing with the F_1 to determine the number of segregating factors.

642. 575.12:575.148
575.12:575.74
 LYSENKO, T. D.
(Intravarietal crossing and the Mendelian law of segregation).
 Selektisija i Semenovodstvo (Breeding and Seed Growing) 1938 : Nos. 8-9 :
 1-6.

The author stresses the differences that exist in environmental conditions even within very small sections of a field, in consequence of which the plants will also differ one from the other; between individuals even of a pure line there are also minute inherent differences. By crossing each individual these differences are smoothed out and the resulting population has been found to be more uniform. The statement is made that on the principles of genetics all F_2 hybrids are expected to segregate in 3:1 ratios. Mendel's figures are re-examined and very few families are seen to conform strictly to this ratio and it is maintained that Mendelian ratios are obtained only when such large populations are dealt with that the effect of the various environmental factors that influence segregation is eliminated and only the effect of chance in the distribution of gametes remains operative.

It is further stated that on Mendelian principles the second and later generations from crossing different plants of a variety such as Krymka, which is very variable and rather impure, would be expected to be more variable than the initial population. Experiment has shown the F_2 to be less variable; some of the F_2 families did not segregate at all, although the parental plants giving rise to them differed morphologically. From this it is argued that selection on the part of the egg cell of a male gamete of a similar constitution has occurred and that it should be possible to produce hybrids free from segregation and capable of perpetuating the desirable characteristics of the F_1 .

643. 575.12:575.148
575.12:575.74
 LYSENKO, T. D. and
 DOLGUŠIN, D. A.
(Intravarietal crossing of winter and spring wheat).
 Selektisija i Semenovodstvo (Breeding and Seed Growing) 1938 : Nos. 8-9 :
 7-8.

The authors point out that different varieties respond differently to intravarietal crossing, yield increases of as much as 8 centners per ha. having been obtained from the variety Krymka, under conditions where Ukrainka failed to respond at all. The conditions of growth also affect the response, Ukrainka under other conditions having given an increase of over 3 centners.

The method of cutting through the florets (Cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 1100) has proved less successful than emasculation and has been discarded. Instructions for carrying out emasculation are given.

644. 575.17:632.8
 LINDEGREN, C. C.
**The nature and origin of filtrable viruses. Considered in relation
 to the bacteriophage and in the light of the theory of the gene.**
 J. Hered. 1938 : 29 : 409-14.

A speculative article in which it is suggested that filterable viruses are essentially genes which have become free in the cytoplasm, and are no longer surrounded by a nuclear membrane or by a sheath of chromatic material. It is held that genes and cytoplasm are antagonistic, but are prevented from destroying each other by the fact that they are not normally in contact. It is supposed that in the case of most genes, antibodies exist in the cytoplasm which would prevent their uncontrolled multiplication when freed from the nucleus, but that certain genes may not be restrained in this way, and may therefore act as viruses. It is suggested

that the fact that bacteria are particularly affected by a large number of virus diseases is due to the lesser opportunity for auto-immunization occurring in a free-living cell. The question as to whether viruses and bacteriophages are to be regarded as living substances is discussed.

645. SIRKS, M. J. 575.24
 Der Mutationsbegriff. (**The mutation concept**).
 Arch. Rass.-u. GesBiol. 1936 : 30 : 449-56.

The contents of this paper formed the substance of a lecture delivered to the International Federation of Eugenics Organizations (Cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 409) and is concerned with the definition of the phenomena which may properly be classed as mutations and also with the problem of the origin of spontaneous gene mutations which the author regards as improbable and, in any event, incapable of demonstration.

646. JORDAN, P. 575.24:576.312.32
 Über den Mechanismus der Chromosomenmutationen. (**On the mechanism of chromosome mutations**).
 Naturwissenschaften 1938 : 26 : p. 839.

A brief discussion of criticisms of the so-called "contact theory" of chromosome mutation.

647. MARSHAK, A. 575.243:537.531:581.04
 The stage of mitosis at which chromosomes are rendered less sensitive to X-rays by ammonia.
 Genetics 1939 : 24 : 103-04.

Irradiated cells show particular sensitivity to X-ray treatment at early prophase. This has been attributed to the appearance of positively charged surfaces upon the division of the chromonemata at that stage. This theory is now supported by evidence which indicates that when early prophase cells are treated with ammonia, they are rendered much less sensitive to change induced by X-rays. Sensitivity in the resting stage is not altered by X-ray treatment.

648. ČERNOMAZ, P. A. 575.4:575.1
575.31:581.02
 (The role of selection in Charles Darwin's theory and in present day breeding).
 Selekcija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 10 : 4-10.

A controversial discussion in which the views of Darwin, Timirjazev, Johannsen, Vavilov, Morgan, Lysenko and others are mentioned with reference to the role of variation and selection in genetical theory and practical applications (Cf. also "Plant Breeding Abstracts", Vol. VIII, Abst. 65).

649. SHLYKOV. 575.4:575.1(47)
 (Formal genetics and consistent Darwinism).
 Soviet Subtropics 1938 : Nos. 8-9 (48-49) : 10-18.

A consideration of various aspects of Darwinism in relation to the development of biological science and genetics in the U.S.S.R. since the revolution.

650. DICE, L. R. 575.42:575.115:519.24
 The effectiveness of adverse selection.
 Genetics 1939 : 24 : 68-69. (Abst.).

Selection against a recessive gene is most effective when the homozygous recessives form a large part of the population; as their proportion decreases the effectiveness of adverse selection also decreases, but at a much slower rate. When the homozygous recessives constitute only 10 per 100,000 of the population, the expected reduction of defectives is slightly over 2 per cent per generation.

ORIGIN OF SPECIES, ETC. 576.1

651. STOJANOFF, N. 576.1:581.2
 Am Wendepunkte der systematischen Wissenschaft. (The science of
systematics at the cross roads).
 Spis. Bulg. Akad. Nauk. 1936 : 53 : 95-131.

A critical discussion of the present position of systematic botany. As the idea of a constant systematic unit as a basis of classification no longer exists another basis must be sought which will include the modern ideas of genetics.

652. LAM, H. J. 576.16
 Over de theorie der arealen (Chorologie). [On the theory of areas
 (Chorology)].
 Vakbl. Biol. 1939 : 20 : 77-87.

This paper contains a critical discussion of the Age and Area Theory of Willis with the author's own views on areas of distribution of species and the significance of internal and environmental factors, migration, and other biological factors (including genetical causes) in the determination of the area of distribution of a given organism. A bibliography is appended.

CYTOLOGY 576.3

653. STRAUB, J. 576.3:575
 Zytogenetik. (Cytoogenetics).
 Fortschr. Bot. Berl. 1938 : 7 : 313-25.

Cytological researches on polyploidy and hybridization are reviewed.

654. 576.312.32
633.13:576.312
 SUCHOW, K. S. 633.11:576.312
 (Changes in the nuclei of embryos of *A. sativa* on germination of
 the grains).
 Biologičeskii Žurnal (Biologicheskij Zhurnal) 1938 : 7 : 279-86.

A cytological study in which, *inter alia*, the persistence of the individuality of the chromosomes in resting nuclei is demonstrated in *A. sativa*.

655. BUCK, J. B. 576.312.36:575.24:576.356
On the origin of chromosome rearrangements.
 Genetics 1939 : 24 : p. 66. (Abst.).

It is suggested that complex chromosome rearrangements, apparently requiring two or more simultaneous breaks at widely separated points in the chromosome, may be brought about by a single break if the chromatids are in a tightly coiled condition when the break occurs, and the break involves two or more successive coils of the helix.

656. GUSTAFSSON, Å. 576.353:576.354.4:581.032
 A general theory for the inter-relation of meiosis and mitosis.
 (Preliminary note).
 Hereditas, Lund 1939 : 25 : 31-32.

It is considered, as a result of observations on certain Compositae and on *Alchemilla*, that the type of behaviour of a nucleus in division, whether meiotic, parthenogenetic or mitotic, is determined by its degree of hydration and the time at which hydration occurs.

657. LEVAN, A. 576.354.4:581.04:635.26
The effect of colchicine on meiosis in *Allium*.
 Hereditas, Lund 1939 : 25 : 9-26.

The paper contains a very full account of the effect of colchicine on meiosis and pollen grain mitosis in *Allium*. The species used for most of the investigations was *A. cernuum*, and the most effective treatment was immersion of the developing inflorescence in 1 per cent colchicine

solution for four days. Fixations were subsequently made at daily intervals until the 12th day after the end of the treatment.

The effect of the treatment depends upon the stage of the nuclear cycle at which it takes place. There is no effect on the resting stage. In prophase two effects are apparent, inhibition of chiasma formation, leading to complete or partial asynapsis, and partial inhibition of chromosome contraction. Both these effects are similar to the effects of known genes.

When metaphase or anaphase I is affected, spindle formation and the normal repulsion between the centromeres of a bivalent are inhibited. The chromosomes separate after some time as a result of body repulsion. They are cruciform at this stage and the two halves of each bivalent lie close together. The centromeres of these chromosomes then divide, so that each original bivalent gives rise to four chromosomes lying near to each other. There is no interkinesis. The final product is a spherical monad pollen grain.

The effect of colchicine treatment on pre-meiotic mitoses, on the second meiotic division and on pollen grain mitosis closely corresponds to that already described for root tip mitosis (Cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 1637). There are minor differences due to differences in coiling and degree of contraction of the chromosomes.

658. BONTE, R. 576.356.5
Was ist diploid und triploid? (**What is diploid and triploid?**)
Obst- u. Gemüseb. 1938 : 84 : 159-60.

This popular explanation of the terms diploid and triploid is intended as an aid to practical horticulturalists confronted by the problem of how to obtain fruit seedlings that are true to seed.

659. BLAKESLEE, A. F.,
WARMKE, H. E. and 576.356.5:581.04
AVERY, A. G. 576.356.5:575.127.2
Characteristics of induced polyploids in different species of angiosperms.
Genetics 1939 : 24 : p. 66. (Abst.).

Chromosome doubling has been induced by colchicine treatment in 65 different kinds of flowering plants, representing 41 species, 24 genera and 14 families. Among them are 3 sterile inter-specific hybrids, from which fertile amphidiploid forms have been obtained.

In general, tetraploids are more robust than diploids, though in some species the differences are slight. In most species the flowers are larger in the tetraploid form, but in some cases tetraploids and diploids are indistinguishable on the basis of this character.

660. LEFÈVRE, J. 576.356.5:581.04
L'obtention expérimentale de végétaux polyploïdes—observations sur son intérêt agricole. (**The experimental production of polyploid plant—observations on its importance to agriculture**).
C.R. Acad. Agric. Fr. 1938 : 24 : 944-54.

A brief account of the production of polyploidy by means of colchicine and the possibilities offered by the new method towards the creation of new and fertile varieties. If it were also possible to produce the haploid condition experimentally and then to double the chromosome number, fertility would be restored and complete homozygosity attained.

661. LEFÈVRE, J. 576.356.5:581.04
Similitudes des actions cytologiques exercées par le phényluréthane et la colchicine sur des plantules végétales. (**The similarity of the cytological action of phenylurethane and colchicine on seedlings**).
C.R. Acad. Sci. Paris 1939 : 208 : 301-04.

Treatment of grains of wheat before or during germination showed that the same results were obtained as by the use of colchicine. It is suggested that in some way an inhibition of certain dehydrogenases may be the cause of the action of phenylurethane and similar substances.

662. SIMONET, M. 576.356.5:581.04
 Sur l'obtention de plantes géantes et polyploïdes, après application de colchicine. (**On the production of giant plants and polyploids after the application of colchicine**).
 C.R. Acad. Agric. Fr. 1938 : 24 : 846-50.

Polyploid plants of *Linum usitatissimum* and *Raphanus sativus* are described which have been obtained by treatment of seeds with colchicine. In both cases the plants were tetraploid, for flax $n = 30$ and for the radish $n = 18$. The paper is introduced by a short general talk on the subject by M. Schribaux.

663. GAVAUDAN, P.,
 GAVAUDAN, N. and
 DURAND, J. 576.356.5:581.04:633.1
 Sur l'induction de la polyploidie dans les cellules somatiques de quelques Graminées par action des vapeurs d'acénaphthène. (**On the induction of polyploidy in the somatic cells of certain Gramineae by the action of acenaphthene vapour**).
 C.R. Acad. Sci. Paris 1938 : 207 : 1124-26.

Grains of *Triticum vulgare* and *Hordeum distichum erectum* were germinated in contact with the acenaphthene vapour. Numerous polyploid cells were found in the roots as a result of the treatment.

664. LEVAN, A. 576.356.5:581.43:577.17:635.25
 Cytological phenomena connected with the root swelling caused by growth substances.
 Hereditas, Lund 1939 : 25 : 87-96.

A cytological examination was made of the swollen portion behind the tips of *Allium* roots treated with growth substances. Such treatment causes (1) an increase in the volume of the cortical cells at a certain stage in their development, (2) an increase in the number of mitoses in the apical meristem, (3) a change in cell polarity, and (4) increased meristematic activity in the pericycle.

Chromosome behaviour in the enlarged cortical cells was abnormal and chromosome doubling was found to occur in a way not previously reported in plants. Prophase chromosomes, instead of being split lengthwise into two, were quadripartite, the strands showing relational coiling. At this stage the centromeres were undivided.

Two divisions of the centromere occurring during the subsequent mitosis gave rise to daughter nuclei with the double number of chromosomes. Many tetraploid and some octoploid divisions were observed in the cortex. Some of the tetraploid divisions were normal, indicating that the doubled cells which originated in the above anomalous way could divide again.

It is suggested that the chromosome doubling is caused by the stimulus of cell enlargement and an analogy is drawn with conditions previously reported in *Culex* and in the salivary glands of Diptera. Growth substances have been used by Greenleaf (Cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 905 and Abst. 809 below) to induce polyploidy in *Nicotiana*. It is suggested that chromosome doubling may have been brought about in this material by a process similar to the above.

EXPERIMENTAL TECHNIQUE 578.08

665. PEHL, P. 578.081:575:633.42
 Eine Formentafel als Hilfsmittel bei der Züchtung von Grünfütter-
 Brassicaceen. (**A form table as an aid in the breeding of forage
 Brassica**).
 Züchter 1938 : 10 : 331-32.

A table is illustrated from which the main leaf characters of five types of *Brassica* can be described by means of numbers.

666. KOLESNIK, I. D.

581.143.26.03

(The works of Academician Lysenko).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1938 : Nos. 8-9 : 9-13.

Reference is made to vernalization, the production of early varieties by crossing on the principle of phasic development, the conclusion that no heterozygous form will give in segregation forms earlier than itself and that that character will be dominant which finds conditions favourable for its development. Figures are given illustrating the success of the varieties produced on the phasic principle and of the method of summer planting of potatoes to avoid degeneration. Reference is also made to the production of two early maturing cotton varieties Od.1 and Od.2 of improved yield and ginning out-turn, larger bolls, less tendency to shedding and gummosis and longer lint; to the method of intravarietal crossing of wheat and the improvement it has effected in the yield, hardness and baking quality of the resulting material; to the production of spring forms of winter wheat; and to the latest work on "vegetative hybrids"—i.e. grafts of two different species or genera combining the properties of both.

667. WHITE, O. E.

581.143.32:575.1:633.71

Fasciation—its characteristics, distribution, origin, heritability, relation to environment, and plant-world analogy to cancer.

Genetics 1939 : 24 : p. 89. (Abst.).

Fasciation may affect any part of the plant. It is not correlated with changes in chromosome number, though it may produce meiotic irregularities. The phenomenon is known in most families of vascular plants, and it may originate as a gene mutation or as a result of environmental effects. Genetically determined fasciated races centuries old are known in *Pisum* and *Celosia*, and similar races of lesser age in *Nicotiana*, *Oenothera* and *Zea*. These breed true to type.

In some cases environmentally produced fasciations have been propagated asexually.

Fasciated races of *Nicotiana Tabacum*, when crossed with normal, give a 1 : 2 : 1 segregation in certain combinations of strains and very complicated results in other combinations. In the latter case, the effect of modifying factors is very apparent and non-fasciated segregates which carry the fasciated genes may be produced.

FIELD TESTS 631.421

668. SALMON, S. C.

631.421

Unbalanced arrangements of plats in Latin squares.

J. Amer. Soc. Agron. 1938 : 30 : 947-50.

The author calculates the probabilities associated with all plots of the same variety falling together in a diagonal of a Latin square of side 4, 5 or 6 plots long. The fact that these probabilities are not small leads him to conclude that the imposition of row and column restrictions on otherwise random arrangements increases the tendency to unbalanced distributions. He argues that some of the supposed advantages of restricted random arrangements are not realised in practice, and suggests that agronomists are or should be more concerned with the accuracy and reliability of an experiment than with the accuracy of the estimate of random error.

J. W.

ECONOMIC PLANTS 633

669. ÅBERG, E.

633:575(47)

Växtförädlingsstudier i Sovjetunionen sommaren 1937. (Studies on plant breeding in the Soviet Union in the summer of 1937).

Sveriges Utsädesfören. Tidskr. 1938 : 48 : 412-23.

An account of visits to the institutions connected with plant genetics at Leningrad, Moscow, Kharkov, Jalta, Odessa, and Kiev.

670. BRUMAN, A. J. 633:575:631.524
Genetic aspects of plant introduction. An approach to the heredity-environment problem in plants.
 Sci. Mon. N.Y. 1938 : 46 : 120-31.

The interaction between agricultural plant introduction work and the work of the plant breeder is discussed. Now that the breeder has interested himself in "wide" crosses, the plant explorer must pay attention to non-economic species and genera related to our crop plants.

The interaction of genotype and environment is complex and largely unpredictable, and introduction of new varieties of crop plants into other regions may lead to the discovery that they are better adapted to those regions than to the one in which they were produced.

671. SWINGLE, W. T. 633:576.1:575:631.524
New research methods for the study of economic plants.
 Amer. J. Bot. 1938 : 25 : p. S7. (Abst.).

Up-to-date taxonomic monographs of all groups of plants containing major crop plants are shown to be fundamentally important for modern plant breeding by bringing to light all wild relatives and by showing the approximate degree of relationship between cultivated and wild forms.

672. SNELL, K. 633-2.9(43)
Sortenschutz durch Registrierung. (The protection of varieties by means of registration).
 Züchter 1939 : 11 : 22-24.

The advantage of a scheme for the registration of varieties, which would mean that all varieties would be tested before they were put on the market, is discussed.

CEREALS 633.1

673. ÅKERMAN, Å. 633.1:575(48.5)
Die Möglichkeit, die Qualität unserer Getreidearten durch Züchtung und Stickstoffdüngung zu verbessern. (The possibility of improving the quality of our cereals by breeding and manuring with nitrogen).
 Z. Zücht. 1938 : A 22 : 551-63.

In this account of research in Sweden on the improvement of quality in cereals by breeding and by cultural measures, methods of determining baking quality are also discussed. As regards winter wheats, some good results have been obtained by crossing old Swedish land forms, which are of high baking quality, with Svea II and wheat No. 0871 which possesses not only good baking qualities but also winter-hardiness and high yield. Line 28/1056 derived from a land wheat from Holland has also been used in crosses in order to increase winter-hardiness. Lines of Finnish land wheats as well as high quality varieties from Hungary, Russia and U.S.A. are also being used as breeding material.

Among the spring wheats the new variety, Diamant II, is outstanding and surpasses the old Diamant wheat in both yield and quality.

The importance of protein content in determining baking quality is affirmed and the influence of cultural measures, including crop rotation and the application of nitrogenous and other manures upon grain quality is discussed.

The problem of eliminating germination in the ear has also been attacked by the breeding of varieties that ripen slowly and this object has been attained with the variety No. 0871 and other recent productions such as the varieties Ankar, Åring, Gyllen, Ergo, and Thule II also appear to be less prone to the defect. The same problem is now being investigated for rye, in which, however, no varietal differences as regards rate of germination have so far been recorded.

Barley breeding in Sweden follows two different lines according to whether the crop is required for malting or for fodder, low protein content being desirable in the first case and high protein content in the second case. Here again the role of suitable manuring has been investigated.

In oat breeding a high protein content is desirable and combined variety manuring trials form part of the research programme. In recent years crosses have been made with the old Ligo variety of oats which still remains unsurpassed as regards quality.

674. HENKEL, P. and 633.1-2.111-1.521.6
KOLOTOVA, S. 633.1-2.112-1.521.6
(**Hardening before sowing and frost-hardiness of the plants**).
Symposium dedicated to the memory of V. N. Lubimenko. Acad. Sci.
Ukr. S.S.R. Inst. Bot., Kiev 1938 : 195-206.

This paper deals mainly with the physiological aspects of the subject and with relevant experiments with wheat and rye. Incidentally the writers are led to suppose that hardening against drought must necessarily increase frost resistance.

675. STRAIB, W. 633.1-2.452-1.521.6:575
Ergebnisse und Probleme der Getreiderostforschung. (**Results and
problems of research on cereal rust**).
Angew. Bot. 1938 : 20 : 349-65.

A lecture on some of the problems and results of the rust investigations carried out at the Brunswick Institute, of special interest for Germany.

Rust remains, in spite of every effort, one of the most important disease factors which limit the cereal yield in Germany to-day.

WHEAT 633.11

676. DONÀ dalle ROSE, A. 633.11:575(45)
Cinque razze di frumento. (**Five varieties of wheat**).
Ital. Agric. 1938 : 75 : 679-83.

Descriptions are given of the following five new varieties of wheat produced by the Società Bolognese "Produttori Sementi".

San Giorgio, derived from the cross Inallettibile 95 x Ardito; is resistant to rust, cold and lodging. Quaderna—a selection from a natural cross, parentage unknown; is resistant to rust and of good baking quality. Riale from the cross Ardito x Gentil Rosso 48; is resistant to rust and lodging. Pieve, also derived from the cross Ardito x Gentil Rosso 48; is resistant to rust and on account of the quality of its gluten may be considered as one of the best "strong" wheats cultivated in Italy. Reno, from the cross Inallettibile x Ardito; is resistant to rust and lodging.

677. POKHIL', I. F. 633.11:575(47)
(**Results of work on breeding winter wheat at the Verkhnyač Breeding
Station**).
Seleksijska i Semenovodstvo (Breeding and Seed Growing) 1938 : Nos. 8-9 :
22-25.

Brief descriptions are given of the varieties produced in the early years of the station.

Varieties 09 Lutescens and 015 Erythrospermum have given particularly good results, especially in the Ukraine and N. Caucasus. Among the newer varieties produced special mention is made of No. 017 Lutescens from the cross T/389 x Ukrainka, which has exceeded all other varieties in yield of grain, giving 14.1 per cent more than Ukrainka; its grain is large, vitreous and of good quality and the plant is possessed of group immunity from rust and smut and free from lodging. The best varieties have invariably been obtained from the crosses involving Ukrainka.

Recently the F_1 hybrids have been crossed with the best standard varieties.

678. CLARK, J. A. 633.11:575(73)
Registration of improved wheat varieties, XII.
J. Amer. Soc. Agron. 1938 : 30 : 1037-42.

Three new wheat varieties, Nebred, Pilot and Thorne, approved for registration during 1938, are described.

Nebred was selected in Nebraska from a plot of the variety Turkey, the chief basis of selection being resistance to bunt. It shows considerable resistance to the forms of smut occurring in the Great Plains. The milling quality is very good, and it gives higher yields than Turkey. Pilot was obtained from a Hope x Ceres cross made in North Dakota. Re-selections have recently been made under conditions of high rust infection. The superior characters of the variety are high resistance to both stem and leaf rust and to bunt. It is high yielding and of exceptional milling and baking quality.

Thorne was developed in Ohio from a Portage x Fulcaster cross, and was registered because of its high yielding ability, having surpassed Trumbull and Fulhio in tests at 15 stations.

679. BLARINGHEM, L. and CHIN, K. C. 633.11:575.127.2:575.183
Nouveaux cas de xénie chez les hybrides de blés (*Triticum monodurum*, *Tr. aegilopoides*, *Tr. vulgare*). [New cases of xenia in wheat hybrids (*T. monodurum*, *T. aegilopoides*, *T. vulgare*)].
C.R. Acad. Sci. Paris 1938 : 207 : 1141-44.

Cases of xenia are described which have been observed at various dates in the crosses *T. monococcum* var. *vulgare* x *T. aegilopoides*, *T. monococcum* x *T. durum*, *T. monococcum* x *T. polonicum* and *T. monococcum* x *T. vulgare*.

680. LOVE, R. M. 633.11:575.127.2:576.312.35:576.356
Cytogenetics of *vulgare*-like derivatives of pentaploid wheat crosses.
Genetics 1939 : 24 : p. 92. (Abst.).

Vulgare-like plants in the F_5 , F_6 and F_7 of crosses between *T. durum* var. Iumillo and four varieties of *T. vulgare* were studied. Of 336 such plants examined in 50 lines, 12, 3, 27, 50, 98, 140 and 6 plants had 28, 38, 39, 40, 41, 42 and 43 chromosomes respectively. The 28-chromosome plants were confined to two lines. Only five of the lines examined consisted entirely of plants with 42 chromosomes.

Fifteen per cent of the plants exhibited re-arrangements of chromosome segments. Fourteen plants had a heteromorphic bivalent, 14 had a trivalent, 10 a quadrivalent, 8 a ring univalent, 3 exhibited chromosome fragmentation, one had two trivalents and two had two quadrivalents. One in seven of the 42-chromosome plants had detectable chromosome re-arrangements.

Each plant was examined morphologically for 18 spike characters, and in general the 42-chromosome plants were found to be the most *vulgare*-like. Exceptions occurred, however, in some plants with re-arrangements of chromosome segments.

681. LOVE, R. M. 633.11:575.127.2:576.353:581.466
Somatic variation of chromosome numbers in hybrid wheats.
Genetics 1938 : 23 : 517-22.

Hybrids between *Triticum durum* var. Iumillo and five varieties of *T. vulgare* were studied in the F_5 , F_6 or F_7 generations. A small proportion of the plants examined had pollen mother cells with abnormal chromosome number occurring in the same anther with PMC with the normal somatic chromosome number (which varied from 39 to 42 in the different plants examined). For instance, in a single anther of a 41-chromosome plant of Iumillo x Hope F_7 , there were 49 PMC with the expected 41 chromosomes, and 20 with chromosome numbers varying from 20 to 30.

It is concluded that these abnormal PMC arise as a result of abnormal mitoses in a late stage in the ontogeny of the anther, such abnormal mitoses being a consequence of the hybridity of the material. It is presumably due to a specific combination of mutually incompatible genes or cytoplasm-gene combinations, since 320 of the 336 hybrid plants studied showed complete regularity of the PMC chromosome number, in spite of the fact that 184 of these were unbalanced aneuploid types.

The exact origin of some of the aberrant PMC was fairly clear. In one 42-chromosome plant, two adjacent PMC had $29_{II} + 3_I$ and $10_{II} + 3_I$ respectively. These two cells have a total

of 84 chromosomes, and clearly arose from an atypical premeiotic mitosis, in which 61 chromosomes went to one pole and 23 to the other.
In another anther, 14 aberrant PMC were found, each with 30 chromosomes ($11_{II} + 8_I$). It seems very likely that these arose from a single atypical mitosis at least four cell generations before meiosis.

682. MATSUMURA, S. 633.11:575.127.2:581.483:576.312.35
Weitere Untersuchungen über die pentaploiden *Triticum*-Bastarde VIII.
Die Entwicklung der verschieden-chromosomigen Endospermen in den
Rückkreuzungen des Bastards *T. polonicum* x *T. spelta* zu den Eltern.
(Further investigations on the pentaploid *Triticum* hybrids VIII.
The development of the endosperms with different chromosome
numbers in the back-crosses of the hybrids *T. polonicum* x *T.
spelta* to the parents).

Jap. J. Bot. 1938 : 9 : 259-75.

The investigations were made on crosses of the F_1 of *T. polonicum* L. var. *vestitum* Körn. x *T. Spelta* L. var. *Duhamelianum* Körn. with the parent species. In the crosses of the F_1 x *T. polonicum* and *T. Spelta* x F_1 almost all the grains were plump and germinated well. The size of the grains increased with the decrease of the number of *Spelta* chromosomes in the first named cross and with their increase in the last named cross.

The grains of the cross *T. polonicum* x F_1 and F_1 x *T. Spelta* were thin and wrinkled and on the whole germinated badly. The decrease in the degree of wrinkling was correlated with the increase of the *Spelta* chromosomes in the cross F_1 x *T. Spelta* and with their decrease in the cross *T. polonicum* x F_1 . The grains with the pentaploid embryos and heptaploid endosperms were the most markedly wrinkled or shrunken. In the combination *T. polonicum* x F_1 , in which many of the grains were wrinkled, there was a clear correlation between the chromosome number and the period before the germination of the grain but no such correlation was found in the cross *T. Spelta* x F_1 in which nearly all the grains were plump. The germination is therefore dependent, not on the plumpness of the grain but on the degree of wrinkledness. The grains that fail to germinate and that die in the seedling stage have as a rule embryos with ± 35 chromosomes and an endosperm with the formula $3(AB) + (\pm D)$ where D = the *Spelta* chromosomes.

683. CAMUS, A. 633.11:575.127.5:633.11 *Aegilops*
Les x *Aegilotriticum* (*Aegilops* x *Triticum*) de la flore française. [The *Aegilo-
triticums* (*Aegilops* x *Triticum*) of the French flora].
Riviera Sci. 1938 : 25 : 14-16.

Records of three hybrids, *Ae. triuncialis* x *T. vulgare*, *Ae. triaristata* x *T. vulgare* and *Ae. ovata* x *T. sativum tenax* found wild in France and of three others, *Ae. ovata* x *T. vulgare* x *T. vulgare*, *Ae. ovata* x *T. Spelta* and *Ae. ventricosa* x *T. turgidum*, artificially produced.

684. KATAYAMA, Y. 633.11:575.127.5:633.11 *Aegilops*:576.3
Progenies of some intergeneric hybrids among *Aegilops*, *Triticum*
and *Aegilotriticum*.
Jap. J. Bot. 1938 : 9 : 335-51.

The hybrid *Triticum durum* x *Aegilops ventricosa* had 0 to 3 (rarely 4) bivalents at meiosis, the remaining chromosomes being unpaired. It set no seed when bagged, but a small amount when open-pollinated. F_1 egg cells with the unreduced chromosome number or nearly so were found to be functional.

The hybrid *Aegilotriticum* No. 3 x *T. vulgare* usually showed 14_{II} and 21_I . It was also sterile when bagged, but set some seed when open-pollinated.

From these two crosses, and the back-cross of the latter to *T. vulgare*, a number of balanced 42-chromosome strains with relatively high fertility were obtained. The occurrence of such strains is considered to show the possibility of obtaining economically useful selections other than amphidiploids from such crosses.

685. ROSENSTIEL, K. von 633.11:575.127.5:633.14:664.641.016
 Über Weizen-Roggen-Bastarde. (**On wheat-rye hybrids**).
 Forschungsdienst 1938 : Sonderheft 10 : 63-76.

A brief and general account of the production of wheat-rye hybrids and their economic value. Their yield is low but they are very winter-hardy. They possess both wheat and rye types of protein and the results of baking tests are good. They are outstandingly early in ripening and are resistant to both rust and mildew.

686. PETO, F. H. 633.11:575.127.5:633.289
 576.356.5:581.036
**Chromosome doubling induced by temperature shocks in hybrid
 zygotes of *Triticum vulgare* pollinated with *Agropyron glaucum*.**
 Genetics 1939 : 24 : p. 93. (Abst.).

Temperature shocks (42-44° C. for 20 minutes) were effective in doubling the chromosome number in several wheat zygotes of the variety Marquis, but ineffective when applied to the sterile F₁ *Triticum vulgare* x *A. glaucum*. Doubling was effected, however, in at least one hybrid zygote by alternating hot and cold treatments, viz.: 3 hours at 36° F, 3 hours at 109° F, 3 hours at 36° F and 3 hours at 109° F. The meiotic behaviour and fertility of the resulting 84-chromosome plant has not yet been determined.

687. PETO, F. H. 633.11:575.127.5:633.289:576.356:581.162.5
**Fertility and meiotic behaviour in F₁ and F₂ generations of *Triticum-
 Agropyron* hybrids.**
 Genetics 1939 : 24 : p. 93. (Abst.).

Some F₁ plants of crosses between *T. vulgare* (2n = 42) and *A. elongatum* (2n = 70) are moderately fertile, having on the average less than 7 unpaired chromosomes, whereas the sterile F₁ plants usually have about twice as many.

A cytological study was made of F₂ plants of varying degrees of fertility (0-53 per cent) from the progeny of a single F₁ plant.

Plants with 54, 55, 56 and 59 chromosomes were found, the number observed in each class being 1, 2, 6 and 1 respectively. It therefore appears that the chromosome number of this cross will stabilize at 56 and not at either of the parental numbers. There were less than six univalents in all but one plant. No correlation was found between the number of univalents and fertility, so that failure of pairing is not the limiting factor for fertility in the F₂. The range of fertility is probably due to the occurrence of translocations between partially homologous chromosomes with consequent irregular segregation of chromosome segments and production of unbalanced gametes.

688. SEKUN, P. F. 633.11:575.22
(On the question of the variability of varietal characters).
 Selektzija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 10 :
 15-17.

The necessity for allowing for variability due to modifications in the certification of seed is demonstrated by the results of breeding experiments with the winter wheat Moscow 02411, a variety in which anomalies affecting the ear were wrongly regarded as justifying rejection on the grounds of genetic impurity.

A careful study of the variability of varietal characters should be made and special attention given to geographical factors in connexion with all varieties in commercial use.

689. MICZYŃSKI, K. (Jr.) 633.11:575.242:581.45
 Ciekawa anomalia pochwski keilkowej pszenicy. (**Peculiar anomalies
 of the wheat coleoptile**).
 Kosmos. Lwów 1938 : 63 : Sér. A : 413-15.

In the F₃ of a cross between two varieties of hard wheat, *T. durum* var. *arraseita* Hochst. with 2-6 vascular bundles in coleoptile and *T. durum* var. *hordeiforme* Hort. with 2 vascular bundles.

a seedling was found with only one vascular bundle. The plant was weak and soon died. It was not possible to determine if the anomalies were due to a special genotype or only to an individual variation.

690. LUK'JANENKO, P. P. 633.11:575.42:575.148
(Selection in pure lines of self-pollinated plants).
 Seleksijska i Semenovodstvo (Breeding and Seed Growing) 1938 : Nos. 8-9 :
 14-16.

Yield increases of up to 27 per cent have been obtained by selection within the variety Stavropolka 0328, together with an improvement in smut resistance and size of ear and grain; the selection differs in certain morphological features from the parental strain, which is nevertheless referred to as a pure line.

Similar results were obtained by selection in the variety Ferrugineum H-622, a variety produced from a "constant" F_3 of the cross Marquis x Ferrugineum 13. Certain plants of the improved strain proved more resistant to stem rust.

691. AFANASSYEVA, A. 633.11:576.312.36:537.531
(The stability of the X-ray effect on spring wheat grains).
 Symposium dedicated to the memory of V. N. Lubimenko. Acad. Sci.
 Ukr. S.S.R. Inst. Bot., Kiev 1938 : 151-54.

Cytological evidence is advanced to show that the effects of X-ray irradiation on grains of *T. vulgare* var. *caesium* 0111 still persisted after storage of the dormant grain for 3 years. (Cf. "Plant Breeding Abstracts", Vol. VII, Absts. 170 and 952).

692. SMITH, L. 633.11:576.356.2:581.162.5:537.531
Reciprocal translocations in *Triticum monococcum*.
 Genetics 1939 : 24 : p. 86. (Abst.).

One naturally occurring and 18 X-ray induced reciprocal translocations in *T. monococcum* were studied. These translocations did not reduce fertility to the extent expected by analogy with maize.

Only 11 per cent of bad pollen was found in a plant with a ring of four chromosomes, and roughly the same proportion of florets failed to set seed. In plants with no ring, sterility averaged 5.5 per cent.

Plants with larger rings were produced by intercrossing different interchange types. The average amount of sterility in these plants was as follows: ring of six, 31 per cent; ring of eight, 51 per cent; ring of ten, 66 per cent; two rings of four, 24 per cent; ring of six with ring of four, 48 per cent.

Cytological examination of plants with a ring of four showed that, out of 4,200 cells, 73 per cent had rings arranged in a zig-zag manner, 19 per cent had open rings, and 8 per cent could not be classified.

It is suggested that the slight discrepancy between the percentage of open rings and the amount of sterility may be due to a delay in disjunction of the open rings.

693. SEARS, E. R. 633.11:576.356.52:575
Monosomes, trisomes and segmental interchanges from a haploid of *Triticum vulgare*.
 Genetics 1939 : 24 : p. 84. (Abst.).

Out of 13 plants obtained from seed of a haploid *Triticum vulgare* plant pollinated by a diploid, 11 showed abnormalities at meiosis. In these plants there were altogether 16 chromosomes present in the monosomic condition and 5 in the trisomic. There were also two segmental interchanges, which are attributed to crossing-over in the haploid between paired, partially homologous chromosomes.

Some of the above aberrations affected the morphology, colour, size or vigour of the plants, but others were without appreciable phenotypic effect. In the progeny of monosomic plants

two nullosomics were found, one of which was fertile. A fertile tetrasomic, indistinguishable from normal, was also found in the progeny of a trisomic plant.

The use of chromosome aberrants obtained from haploids provides a new method for the genetical analysis of *T. vulgare* and possibly other polyploid plants.

694. KRISHNASWAMY, N. 633.11:576.356.52:576.312
Cytological studies in a haploid plant of *Triticum vulgare*.
 Hereditas, Lund 1939 : 25 : 77-86.

Chromosome behaviour in a haploid plant of *T. vulgare* obtained from a twin seedling is described. The proportion of cells with 0, 1, 2, 3 and more than 3 bivalents at metaphase I was 59.3, 19.7, 13.7, 5.4 and 0.7 per cent respectively. In one cell 9 bivalents were observed, 8 of which were of the ring type. One per cent of cells showed one trivalent. The probable significance of this high degree of pairing is discussed.

695. FELLER, A. and MOSTOVOJ, K. 633.11:581.142:537.5
(The effect of short waves and γ -rays on the germination of wheat).
 Acta Radiol. Cancerol. Bohemoslovenica, Praha 1938 : 1 : Pp. 6.

A study was made of the effect of the combined action of irradiation with short wireless waves and γ -rays upon the germination of wheat seed, and the effect of different doses of the two kinds of treatment administered separately. Air-dry grains of pure varieties of *Triticum vulgare* x *T. durum* were used.

It was found that germination capacity, as determined by the total germination and by the number of seeds exhibiting root development, was not injured by the doses but germination was more or less retarded.

The reduction in the percentage germination due to retardation was specially noticeable in the series treated with short waves only. Their inhibitory action still persisted 7 days after the germination began and was shown to be specific and not due merely to the effect of heat, which, on the contrary, stimulated growth.

The combined action of γ -rays and short waves slightly retarded the onset of germination.

Irradiation with γ -rays stimulated germination in *T. vulgare* only after a dosage of 2175 r, but in *T. durum* a considerable increase in germination percentage was observed with 943 r.

696. MICZYŃSKI, K. (Jr.) 633.11:581.46:575
 Nadliczbowe kłoski w kłosie niektórych odmian pszenicy pospolitej
 (*Triticum vulgare* Vill.). (**Supernumerary spikelets in several varieties
 of *T. vulgare* Vill.**).
 Acta Soc. Bot. Polon. 1937 : 14 : 269-82.

Supernumerary spikelets were found in a number of varieties but most frequently in the three Italian winter wheats Trieste, Gorizia and Ardito. The tendency is inherited. A positive correlation was found between the length of the rachis segments and the number of duplicated spikelets within the pure lines of Trieste and Ardito.

As the ear length is closely connected with the size and luxuriance of the whole plant, the correlation is a further proof of the dependence of the formation of anomalies of the ear, etc., within a variety, on nutritional factors.

697. MICZYŃSKI, K. (Jr.) 633.11:581.48:575.061.6:578.088.1
 Genetische Studien über die Phenolfarbenreaktion beim Weizen. (**Genetic
 studies on the phenol colour reaction in wheat**).
 Z. Zücht. 1938 : A 22 : 564-87.

The F₂ generation from a series of crosses made between eight Polish varieties of winter wheat provided the material for this study in which over 2500 plants were examined to determine the mode of inheritance of the various characters including the phenol reaction of the grain and ear.

The determination of the unawned condition by a single dominant gene was confirmed. The red eared varieties, Zaborzanka, Dublanka and Kujawianka, were found to differ from the white eared, Wysokolitewka, Tryumf Mikulic and Płocka by a dominant factor which is,

however, different in Dublanka and Kujawianka. Adopting Nilsson Ehle's factor terminology, the genetic formula for Dublanka is $b, b, B_2 B_2$ and that for Kujawianka $B_1 B_1 b_2 b_2$. Of the three polymeric factors for grain colour, found by Nilsson Ehle, $R_1 R_2$ and R_3 the red grained variety Zaborzanka was found to carry all three, while Kujawianka, which is also red grained, has only two.

The phenol reaction of the grains is attributed to one or two genetic factors, dark pigmentation being dominant. Kujawianka and Płocka carry one such factor and Zaborzanka two, F_I and F_{II} . Moreover it is thought probable that various accessory factors may also be operating to determine the minor colour gradations observed in the reaction.

The phenol coloration of the glumes is conditioned by a dominant factor Φ and Zaborzanka has the formula $\phi\phi F_I F_I F_{II} F_{II}$ while Wysokolitewka is of the constitution $\Phi\Phi f_I f_I f_{II} f_{II}$.

Complete linkage was found between ϕ and F_I . On the other hand no definite evidence of linkage was found between the phenol reaction of the grain and glumes on the one hand and the natural colour of the ear, awning, etc., on the other, though it seems probable that the natural grain colour exerts a slight influence upon the intensity of the pigmentation in the phenol reaction, possibly owing to the operation of subsidiary accessory factors which may be linked with the grain colour factors.

Experiments with numerous wheats were also made demonstrating the dependence of the phenol pigmentation reaction of the glumes upon their oxidase content, thus providing a further instance of the Mendelian inheritance of the oxidase content in plants.

The methods and the results of previous workers are discussed throughout the paper.

698. Voss, J. 633.11:581.48:578.088.1
Über sorteneigene Oxydations-und Reduktionsfermente bei *Triticum sativum* L., ihre Verwendbarkeit zur Sortenunterscheidung. (**On varietally specific oxidation and reduction enzymes in *T. sativum* L. and their use for differentiating varieties**).
Angew. Bot. 1938 : 20 : 265-348.

Varietal differences in the tyrosinase activity of a number of German wheats were demonstrated by means of a qualitative colour reaction in the germinating grain and the glumes. Tyrosinase activity is thought to underly the differential phenol reaction obtained from different varieties of wheat.

Varietal differences were also found in the polyphenolase activity of wheat and also in other reduction and oxidation phenomena. By the peroxidase test with the leuco-base of malachite green it was possible to distinguish grains of the Peragis and Janetzki spring wheats, which had hitherto been impossible by the phenol test of the grain.

The chemical aspects of the problem are fully discussed with incidental references to previous work in the field.

699. DWORAK, K. 633.11-1.557:575(43)
Gedanken zur Züchtung des Winterweizens im mittleren Donaubecken. (**Discussion on the breeding of winter wheats in the central Danube basin**).
Pflanzenbau 1938 : 15 : 234-39.

A discussion of the relative merits for cultivation, especially from the point of view of yield, of the types suitable for high and low fertility levels of agriculture.

For the conditions in Hungary the types which give a certain average yield with low fertility levels of agriculture are recommended for cultivation and for breeding purposes.

700. ISENBECK, K. 633.11-1.557:664.641.016:575
Sind gute Qualität und Ertrag kombinierbar? (**Is it possible to combine good quality and yield?**).
Forschungsdienst 1938 : Sonderheft 10 : 44-51.

A general review of the question of the possibilities for the combination of high yield and good quality in wheat.

Experiments have shown that a combination of high yield and high gluten quality is not only practicable but is an accomplished fact. The combination of high protein content and high yield has yet to be obtained. It is probable that some districts will always be more suitable for the cultivation of high-yielding wheats of good baking quality than others.

701. ŠESTAKOV, V. E. 633.11-2.111-1.521.6:575.12
 (The study of frost resistance of winter crops in connexion with
 the selection of parent forms for crossing).
 Selektivna i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 10 :
 10-13.

The Saratov Breeding Station has investigated the role of the light stage in the frost resistance of winter crops, the nature of the hardening process and the changes in frost resistance as a consequence of thawing. Wheat and other cereals and *Agropyrum* were used in the experiments in which the following conclusions among others were reached:—

In order to obtain new varieties with increased frost resistance at the vernalization stage it is advisable to choose as parents two plants such that one becomes well hardened in the first phase of hardening and moderately so in the second phase, while the other shows moderate hardening in the first phase and pronounced hardening in the second phase.

Changes in frost resistance in wheat hybrids are to be studied.

702. SCHLUMBERGER. 633.11-2.113-1.521.6:575
 Die Widerstandsfähigkeit von Weizenzuchtsorten gegen Hagel. (The
 ability of varieties of wheat to withstand hail storms).
 Dtsch. landw. Pr. 1937 : 64 : p. 293.

The author criticizes the suggestion that it is possible to breed resistant varieties.

703. EGOROV, D. V. 633.11-2.183-1.521.6:581.44
 (Lodging of spring wheat under irrigation).
 Socialistic Grain Farming, Saratov 1938 : No. 1 : 84-102.

Lodging in wheat is discussed under the following heads: lodging and recovery; the root and tillering node as well as the stem in plants that have lodged; influence of the soil; reduction in yield due to lodging; and varietal differences in resistance to lodging, as recorded by various workers in the U.S.S.R. and elsewhere.

A study of the anatomical and histological structure of the stem is an important aspect of the selection or breeding of non-lodging wheats for irrigated regions in the U.S.S.R.

704. MILAN, A. 633.11-2.451.2-1.521.6:575
 Prove estive sull' "*Ustilago tritici*" (Pers.) Jens. con varietà di grano precoci.
 [Summer experiments on early wheat varieties with *U. tritici* (Pers.)
 Jens.].
 Riv. Patol. Veg. 1937 : 27 : 287-96.

A method is described by which the author was able to grow two generations of wheat in one year for the purpose of testing resistance to *Ustilago tritici*.

Plants grown from seed inoculated in the spring were harvested as early as mid-June, and the grain from them was grown in small boxes, where it produced plants with seed fully developed by the end of September.

The results confirmed the high susceptibility of the varieties Mentana, Rachael and Grano 28 Ottobre to loose smut, and the high resistance of Littorio and Federation x Khapli. The F_1 s of the cross (Federation x Khapli) x Mentana and its reciprocal were also very resistant, indicating that the resistance of Federation x Khapli is probably dominant.

705. CRÉPIN, Ch.,
BUSTARRET, J. and
CHEVALIER, R. 633.11-2.451.3-1.521.6:575.11
Nouvelles recherches sur la résistance des blés aux caries. (**New
researches on the resistance of wheats to bunt**).
Ann. Épiphyt. Phytogénét. 1938 : (N.S.) : 4 : 413-47.

After a review of the literature the researches made at the Dijon Experiment Station in 1936-37 are described.

The resistance of a number of varieties and hybrids to several collections of bunt is tabulated and the behaviour of the F_3 and F_4 of a number of crosses is described. The conclusion is drawn that inheritance of resistance is complex and two or more factors are involved.

706. SCHLEHUBER, A. M. 633.11-2.451.3-1.521.6:575.11
**The inheritance of reaction to physiologic races of *Tilletia tritici*
(Bjerk.) Wint. in a winter wheat cross.**
Res. Stud. St. Coll. Wash. 1938 : 6 : 75-96.

Resistance to two races of *Tilletia tritici*, known as the Ft-4 and Ridit races, was tested in the progeny of a cross between the White Odessa and Turkey-Florence varieties of winter wheat. White Odessa is very susceptible, and Turkey-Florence highly resistant, to the race Ft-4. The parental types of reaction were not recovered in any of 108 F_3 families, and it was concluded that at least four genes, cumulative in their effect, would be required to explain the results.

Both parent varieties were moderately susceptible to the Ridit race of bunt. The F_3 showed transgressive segregation. The results fit the hypothesis that the parents differ by two factors, *A* and *B*, influencing resistance to this race, *A* being a dominant factor for resistance, and *B* dominant for susceptibility. White Odessa has the constitution *AABB*, and Turkey-Florence is *aabb*.

There was no correlation between resistance to the Ft-4 and Ridit races of bunt, and it was concluded that different genes are involved in each case.

Resistance studies with a mixture of the two strains were also made.

707. 633.11-2.452-1.521.6(79.6)
633.16-2.452-1.521.6(79.6)
633.14-2.452-1.521.6(79.6)
BEVER, W. M.
**Reaction of wheat, barley and rye varieties to stripe rust in the
Pacific Northwest.**
Circ. U.S. Dep. Agric. 1938 : No. 501 : Pp. 15.

A total of 317 varieties of United States wheats, 1,284 foreign wheat introductions including forms of *T. vulgare*, *T. compactum*, *T. durum*, *T. dicoccum*, *T. turgidum* and *T. polonicum*, 365 varieties of barley and 11 of rye were studied, and their reaction to stripe rust (*Puccinia glumarum*) determined. Varieties were tested in the greenhouse, in the field, or both. For the greenhouse tests physiological race 19 was used, while natural infection which may have contained other races was relied upon for the field tests.

708. KALE, G. T. 633.11-2.452-1.521.6:575
Breeding rust resistant wheat.
Int. Rev. Agric. 1938 : 29 : T 371-81.

A review of the breeding work being done to produce rust-resistant wheat varieties in the more important wheat growing countries of the world.

709. ADAMS, W. E. 633.11-2.452-1.521.6:575.11(75.6)
Inheritance of resistance to leaf rust in common wheat.
J. Amer. Soc. Agron. 1939 : 31 : 35-40.

The inheritance of resistance to leaf rust (*Puccinia triticina*) was studied in crosses between the resistant wheat variety Hope and the susceptible varieties Leap's Prolific, Fulcaster and Purplestraw. Natural infection in the field was relied upon and the exact mode of inheritance

of resistance could not be determined. The F_1 plants of all crosses showed very little infection, perhaps owing to unfavourable weather conditions or to a small supply of inoculum. Segregation was observed in the F_2 , and in the F_3 of all three crosses rows were obtained which contained only highly resistant or intermediate or highly susceptible plants. In each F_3 some of the families showed less than 5 per cent infection.

OATS 633.13

710. KORABLIN, I. I. 633.13:575(47)
(New varieties of oats bred at Omsk).
 Seleksijska i Semenovodstvo (Breeding and Seed Growing) 1938 : Nos. 8-9 :
 20-22.

Varieties maturing in 65 days, 10 days earlier than Golden Rain, having strong straw and large grain (1,000 corn weight of 40 gm. as compared with 35 gm. for Victory) have been produced. Two of the newest varieties are also described: (1) Aurea 06922, produced by individual plant selection from a local strain, exceeding Golden Rain by 15.4 per cent in yield and by 3-4 days in earliness; (2) Aurea 05241 exceeding Golden Rain by 10.8 per cent in yield and by 1-2 days in earliness and superior in size of grain and standing capacity.

711. SANDER, H. G. F. 633.13:575.242:575.113.3:576.312.36
Chromosome aberrations as the cause of fatuoid, steriloid and subfatuoid mutations in oats.
 Genetics 1939 : 24 : p. 94. (Abst.).

Alterations in the normal balance between the C chromosomes and the rest of the complex give rise to fatuoid, steriloid and sub-fatuoid mutations: These changes are produced by deficiencies of various degrees in the C chromosome and behave genetically as multiple allelomorphs.

712. NISHIYAMA, I. 633.13:576.356.5:576.356
(Cytogenetical study on triploid hybrids of oats. I. Cytological investigations into F_1 . II. Chromosome variation in the progeny of the hybrids. III. The relation between sterility and chromosome numbers).
 Bot. and Zool. 1934 : 2 : 1483-88, 2023-29; 1935 : 3 : 919-24.

In oats no viable seed is obtained when a 7-chromosome form is pollinated by a 14-chromosome form. The reciprocal, however, gives seeds which though small, show signs of germinating capacity. In the former cross though the endosperm grows larger this does not indicate normal development; while in the latter cross development is slow but there are no signs of degeneration.

In the F_1 of *Avena barbata* ($n = 14$) x *A. strigosa* or *A. Wiestii* ($n = 7$) the most frequent combinations observed at metaphase I were 7 bivalents and 7 univalents, but occasionally trivalents or quadrivalents occur. Subsequent behaviour of the chromosome is like that in pentaploid hybrids of wheat. Lagging univalents sometimes fail to be included in the daughter nuclei at the second division.

In considering from which parents the trivalents occasionally formed are derived, the author indicates diagrammatically which chromosomes are homologous and which are only partially so and therefore show less tendency to pair. If the genomes of *A. strigosa* or *A. Wiestii* be represented by AA, then *A. barbata* can be represented as AAB'B' and A and B' represent partially homologous genomes.

Part II of the paper contains the following information:—

The triploid hybrid shows a high degree of sterility and during 1929-32 only 120 F_2 plants were available for chromosome counts. These 120 F_2 plants were grouped according to their chromosome number and the chromosome numbers of the F_3 progeny of each are tabulated, peaks occurring at 14-15 and 26-28.

On selfing the F_2 and their progeny the chromosome associations found showed the same type of re-arrangement as occurs in wheat with the exception of (a) one plant with $2n=27(13_{II} + 1_I)$ which was derived from a plant with $2n=28(14_{II})$, and (b) an instance in which of 27 plants

derived from a $2n=14$ plant, 11 resembled the female parent in form and 16 were of the gigas type. Reverting to a discussion of triploid hybrids and types of chromosome associations found in the plants with various chromosome numbers, the frequent occurrence of quadrivalents in the increase group (*Vermehrungsgruppe*) is recorded.

The author believes all the chromosome combinations observed were balanced ones—in contrast to the conditions in pentaploid wheats.

In Part III the word sterility is used to include seeds which do not germinate.

Plants with chromosome numbers ranging between 15 and 27 produce poor pollen with grains inadequately filled.

Embryo-sacs with very few antipodal cells were found to be mostly unfertilized.

Out of 15 fertilized embryo-sacs only one had a normally developed embryo, i.e. 1.32 per cent of the ovaries examined. The set obtained from the F_1 plants was 0.92 per cent. The high embryonic mortality is attributed to unbalanced chromosome combinations.

Considerable variation exists in the productivity of the progeny of the hybrids and is attributed to chromosome irregularities (e.g. numerous univalents and partial homology of the chromosomes). In general, plants with intermediate chromosome numbers tended to produce grains of low germinating capacity and were poorly developed.

Finally, it can be said that the $4x$ (♀) \times $2x$ (♂) cross is successful, but the reciprocal gives no grain capable of germinating.

713. STANTON, T. R.,
MURPHY, H. C.,
COFFMAN, F. A.,
BURNETT, L. C. and
HUMPHREY, H. B.

633.13-2.45-1.521.6:575(73)

New disease-resistant early oats from a Victoria-Richland cross.

J. Amer. Soc. Agron. 1938 : 30 : 998-1009.

In this paper the behaviour of some oat selections from the cross Victoria \times Richland is described. The Victoria parent is highly resistant to crown rusts and smuts, while Richland is a high-yielding, early oat highly resistant to stem rust, widely grown in the Corn Belt.

The selections are resistant to the important races of crown rust, stem rust and smuts found in the Corn Belt, and in addition have very high yielding ability and high bushel weight. One or more of them will probably be distributed to Corn Belt farmers during the next few years.

714. STANTON, T. R.

633.13-2.451-1.521.6:575(73)

Registration of varieties and strains of oats, VIII.

J. Amer. Soc. Agron. 1938 : 30 : 1030-36.

Descriptions of three new oat varieties, Fulton, Carleton and Bannock, approved for registration in 1938, are given with details of their performance.

Fulton arose from the cross Fulghum \times Markton, and is a red oat resistant to smut, early, and of good quality; it usually outyields Kanota in Kansas.

Carleton originates from the cross Sixty-Day \times Markton. It is an early, yellow, common oat resistant to smut and *Fusarium culmorum* and adapted to dry land conditions, where it has high yields.

Bannock was bred from the cross Markton \times Victory, and is a mid-season white oat resistant to most physiological races of smuts. It is about equal to Victory in quality and has high yield.

715. CRÉPIN, Ch.,
BUSTARRET, J. and
CHEVALIER, R.

633.13-2.451.2-1.521.6:575.11

La résistance des variétés d'avoine au charbon nu. (The resistance of varieties of oats to loose smut).

Ann. Épiphyt. Phytogénét. 1938 : (N.S.) : 4 : 391-412.

An account is given of the biology of *Ustilago avenae* and of the methods of infection. The results of varietal tests made at the Dijon Experiment Station in 1932-34 are then described.

Varieties of *A. byzantina*, *A. sativa*, varieties described as "*sativa imparfait*" or off-type *sativa* forms and hybrids of *A. byzantina* x *A. sativa* were used. Some data on the genetics of resistance indicate that several factors are concerned.

716. ROSEN, H. R. and WEETMAN, L. M. 633.13-2.452-1.521.6:575(76.7)
632.452:576.16
The 1938 crown rust epidemic of oats in Arkansas in relation to hybrids of Bond and Victoria.
Phytopathology 1938 : 28 : 898-901.

A new race of crown rust (*Puccinia coronata avenae*), race 45, became prevalent in northern Arkansas in 1937. This race differs chiefly from race 1 in that it severely attacks the oat variety Bond.

Studies were made of the reaction of hybrids of Victoria and Bond to race 45, both in the greenhouse and the field. All Victoria hybrids suffered severely from crown rust in the field, those plants which showed a high degree of resistance in the seedling stage becoming more susceptible as the plants advanced in maturity.

The Bond hybrids were extremely susceptible in the greenhouse, but were very little affected by race 45 in the field. Bond hybrids in the severe crown rust epidemic of 1938 appeared to be far more promising than those of Victoria in their reaction to the races of rust prevalent in northern Arkansas.

717. SCHEIBE, A. 633.13-2.7-1.521.6:575
Das Fritfliegenproblem beim Hafer auf wachstumsphysiologischer Grundlage. (**The frit fly problem in oats from the basis of the physiology of growth**).
Angew. Bot. 1937 : 19 : 260-90.

The author finds that resistance to frit-fly attack is conditioned by physiological factors, among them, the capacity of the grain to form cane sugar.

RYE 633.14

718. DUMON, A. G. 633.14:575.11.061.6:581.48
Een geval van dominant en recessief bruin bij *Secale Cereale*. (**A case of dominant and recessive brown in *S. cereale***).
Agricultura, Louvain 1938 : 41 : 190-96.

During researches on the inheritance of yellow and green grains in rye (Cf. "Plant Breeding Abstracts", Vol. III, Abst. 404) the author found a yellow grain of which the coleoptile instead of being green was faintly red.

This yellow grain giving a reddish coleoptile is distinguished as "brown" as compared with the yellow grain giving a green coleoptile and the character is recessive to the green grain with red coleoptile.

Xenia was also observed in the blue coloration of the aleurone layer of the F_1 grain when the plant with brown grains was pollinated by pollen from a plant with green grains.

The cross yellow grain with brown grain gives a green grained F_1 and in F_2 a dihybrid segregation of 9 green, 3 brown and 4 yellow. This, in the author's opinion, indicates the presence of a cryptomeric factor *B* in the yellow grain. In conjunction with the anthocyanin factor *A* of the brown grain the factor *B* gives a dominant green grain.

The following formulae are proposed:— $AAbb$ = brown grain, coleoptile faintly red; $aaBB$ = green grain, red coleoptile.

A case in which brown grain was dominant to green was observed but has not been completely analysed.

719. DUKA, S. Kh. 633.14:581.143.26:575.127.2
(Methods of breeding cultivated perennial rye).
 Selekttsija i Semenovodstvo (Breeding and Seed Growing) 1938 : Nos. 8-9 :
 19-20.

DUKA, S.
(Selection methods for cultivated perennial rye).
 Symposium dedicated to the memory of V. N. Lubimenko. Acad. Sci.
 Ukr. S.S.R. Inst. Bot., Kiev 1938 : 409-13.

Petkus rye was crossed with *Secale montanum* in 1930. The study of the F_2 to F_6 generations showed the perennial habit to be recessive and linked with brittle ear, which was dominant. Perennial segregates also showed a high degree of sterility, varying from 55 to 90 per cent. To remove these defects it is proposed to back-cross the perennial hybrids with cultivated rye or with hybrids with a tough rachis. Lysenko's method of growing different parts of a single plant in different conditions (Cf. "Plant Breeding Abstracts", Vol. IX, Abst. 233) is thought to be another possibility.

720. 633.14-2.191:537.531
 KAGAWA, F. 633.18-2.191:537.531:575.061.6
(Alteration of characters in some crop plants induced by X-ray irradiation).

Proc. Crop Sci. Soc. Japan 1938 : 9 : 463-70.

Nine plants out of 400 obtained from grains of rye from a strain locally called "Yellow grained wheat" which were subjected to X-ray irradiation developed leaves with green and light yellow striping. The variegated plants were sterile. The effect is attributed to direct action of the X-rays upon the cytoplasm.

In the same year (1934) panicles of the same rye strain were treated with X-rays and in 1936 two dwarfs occurred among 60 plants. Both had numerous tillers and leaves but small panicles and were only 1 ft. 2 in. high when their sister plants had attained a height of several feet.

Rice plants numbering 1800, of normal green colour and of the lowland variety Bansei Sekitori were similarly irradiated. The seed of one partially sterile plant (No. 34-4) was grown in the following year and 290 plants were obtained of which eleven were either light yellow or white and soon died. In 1936 on sowing seeds from six partially sterile green plants in the above mentioned group, three of these plants produced individuals, termed by the author for convenience "albinos," among their progeny. The subsequent generation obtained from plants in progeny No. 34-4 showed that the latter were of three kinds: (1) those producing "albinos" in 1935, (2) those that were green in 1935 but produced "albinos" in the following generation, and (3) those which were green in 1935 and after.

It is believed that according to the parts of the plant treated, irradiation caused different degrees of variability in the genes for green colour.

MAIZE 633.15

721. 633.15:575:578.08
 SPRAGUE, G. F. 633.15-1.421:519.24
An estimation of the number of top-crossed plants required for adequate representation of a corn variety.

J. Amer. Soc. Agron. 1939 : 31 : 11-16.

In maize breeding, one valuable method of evaluating inbred lines in the early stages is to effect "top crosses" between the lines and plants selected at random from an open-pollinated variety. It is important for this purpose to know what is the minimum number of such crosses which need be made to evaluate a particular inbred plant. The results given indicate that 10 to 20 plants form a sufficiently large sample. No serious error is introduced if the seed from these plants is bulked and samples for sowing are drawn from the bulked lot, provided that (a) the size of the samples is not too small and (b) the individual plants do not contribute widely different numbers of seeds to the total populations.

722.

HARVEY, P. H.

633.15:575:631.811.1

635.64:575:631.811.3

Hereditary variation in plant nutrition.

Genetics 1939 : 24 : p. 74. (Abst.).

Inbred strains of maize were grown in aqueous culture solutions supplied with different forms of nitrogen, and analyses made on the total dry weight of the plant when 5 to 6 weeks old. The inbred lines La and PR consistently produced relatively more dry matter on ammonium nitrogen than did the lines Mc, Hy and R4. Inbred lines which utilized ammonium nitrogen efficiently had equal percentages of dry matter whether grown on ammonium or nitrate nitrogen, while the other strains had lower percentages of dry matter when grown on ammonium nitrogen. Single crosses involving the above inbred lines also responded differentially to the two nitrogen forms. Definite parent-offspring correlations in this respect were observed, and the response of the hybrids was in general intermediate between that of the parent lines. Differences between inbred lines in the top-root ratio were also observed.

Strains of two tomato species, *Lycopersicum esculentum* and *L. pimpinellifolium* responded differentially to high and low levels of nitrogen, phosphorus and potassium supplied in culture solutions. Hybrids of strains most extreme in potassium response were tested, and were intermediate in their utilization of a limited potassium supply.

723.

633.15:575.116.1

Recent linkage studies in maize.

Genetics 1939 : 24 : 59-63.

The functions of the "Maize Genetics Co-operation", an association of maize geneticists from the United States and other countries, are briefly outlined. An annual mimeographed "Co-op News Letter" is circulated among members, facilitating the exchange of ideas and unpublished data. Arrangements also exist for the exchange of seed stocks. It is planned to publish each year a group of short papers on linkage, derived from data in the News Letter, of which the following is the first.

H. K. Hayes and M. S. Chang. I. Virescent seedling-16 (v_{16}). (pp. 59-60).

"Virescent seedling 16" (v_{16}) is located in chromosome VIII. The order of genes and recombination percentages in this chromosome are given as v_{16} -13.9- ms_8 -9.5- j . Virescent seedling 16 is allelomorphous with a virescent seedling character found in Minnesota No. 16 maize, which was given the symbol v_{21} .

H. K. Hayes and M. S. Chang. II. Zebra striped-6 (zb_6). (p. 60).

Five cases of "zebra striping" have previously been reported, and two types of expression of the character are known—the striping may be present in the seedling stage, perhaps disappearing later, or it may first appear in partly grown plants. Zebra striped 6 (zb_6) was found in an inbred line of Del Maiz sweet corn, and could not be classified until late summer. It is located in chromosome IV, the order of genes and recombination values being given as: su_1 -13.3- zb_6 -23.3- Tu -20.5- gl_3 .

H. K. Hayes. III. Zebra seedling-4 (zb_4). (pp. 60-61).

"Zebra seedling 4" (zb_4) has been located in chromosome I. Recombination values with Br , F_1 , Bm_2 and P are 31.1, 28.0, 46.0 and 6.9 respectively.

H. K. Hayes. IV. Ramosa ear-2 (ra_2). (p. 61).

The character ramosa ear 2 (ra_2) has rather different phenotypic effects from ra_1 , and can be separated from it in the F_2 of a cross.

W. R. Singleton. V. Opaque endosperm-2 (o_2). (p. 61).

"Opaque endosperm" is a character in which the endosperm has little or no corneous starch. It is phenotypically indistinguishable from "floury", but gives 25 per cent of recessive seeds on segregating ears, whereas "floury" gives 50 per cent. Classification is easy in "flinty" stocks.

Opaque 2 (o_2) is located in chromosome VII, probably beyond v_5 and within two or three units of it. Linkage values with Ra_1 , G_1 and I_j are given.

M. M. Rhoades. VI. White sheath-3 (ws_3). (p. 62).

The recessive character "white sheath 3" (ws_3) is expressed as a deficiency of chlorophyll in the culm and leaf sheaths of the plant. It is located in chromosome II, the order of genes and recombination percentages being $ws_3-11-lg_1-19-gl_2$. The gene ws_3 is nearer to the end of the short arm of this chromosome than any previously known gene. The map distance from ws_3 to ts_1 (which is near the centromere) is 74 units.

724. SOKOLOV, B. P. and

PAVLOWSKI, S. F.

633.15:575.12

(Varietal corn hybrids).

Bull. Ukrainian Sci. Res. Inst. Grain Culture 1937 : Sci. Ser. No. 8 : Pp. 71.

Work on intervarietal hybridization of maize has been in progress in the U.S.S.R. for many years and a simple method of obtaining hybrid seed on a large scale was evolved. Since 1930 comparative studies of F_1 hybrids with their parents have been undertaken, special attention being paid to the degree of heterosis exhibited in the various combinations and to the economic value of the hybrids as regards yield, quality, earliness, etc. Incidentally developmental phases in the maize plant were studied and measurements of morphological characters recorded.

The present report embodies the results obtained at various centres entrusted with the investigations.

Most of the characters studied showed intermediate inheritance in the F_1 , but with the following reservations:—

In crosses between varieties differing markedly in length of the vegetation period the intermediate F_1 as a rule resembled the early parent and rarely the late one, whereas from crosses of parents closely alike in earliness the F_1 often had a longer vegetation period, and more rarely a shorter one.

The intermediate condition in plant height and height of attachment of the cob usually approached that of the taller parent and in some instances even exceeded the one with a higher point of attachment of the cob.

The F_1 also usually resembled the superior parent in regard to the amount of branching and when the parent varieties were alike or similar in this respect the hybrid more frequently somewhat surpassed the parent forms and more rarely showed less branching.

A similar tendency to resemble the superior parent was also evident in regard to the percentage of sterile plants, absence of lodging and yield of kernels. The F_1 from certain combinations even gave a 10–20 per cent higher yield than the superior parent and the control variety, the best results being obtained by crossing varieties belonging to different botanical groups. In resistance to smut and bacterial disease the F_1 , though intermediate, tended to be more susceptible than the parents, but less so as regards *Fusarium* and moth attack.

Other characters studied were moisture content of the grain and yield of culms, the hybrids resembling the superior parent in regard to the former characteristics, but either the good or the inferior parent as regards the latter.

A list of the most promising combinations from 3 years' trials is given.

725.

633.15:575.12(77.7)

635.67:575.12(77.7)

635:575.12(77.7)

Report on agricultural research for the year ending June 30, 1938.

Part II. Iowa Corn Research Institute third annual report. Section

3. Corn breeding.

Ia Agric. Exp. Sta. 1938 : 29–47.

The hybrid corn seed certification activities of the Farm Crops Subsection are described.

The relative merits of making preliminary selections of double crosses at one station (Ames) alone, or at Ames and a station in northern Iowa, are discussed.

Iowa Hybrid 3088 is shown to be very high yielding in the extremely hot and dry years 1934 and 1936, but was below the average of its class in the more favourable years. In this reaction it resembles Iowa Hybrid 13.

Data are presented which show that improvement has been effected in certain pure lines by a process of crossing with other lines, followed by repeated back-crossing or selfing.

A number of inbred lines were tested for resistance to *Diplodia* stalk rot. Considerable variations in resistance were apparent.

Studies were made to determine whether any correlation existed between chemical composition and strength of stalk; determinations of the content of moisture, ash, lignin, alpha-cellulose and water-soluble material were found to be of no use as an index of that character.

With regard to sweet corn, crosses were made for the first time between a number of lines which had been obtained by crossing sweet corn inbred lines to F₁ sweet corn x field corn plants, with four subsequent generations of selfing.

Comparisons were made between yield trials of sweet corn hybrids harvested at the canning stage and at the dry seed stage.

The yield test of popcorn varieties was greatly enlarged, and details are given of the performance of the main varieties. More selfed lines have been made, and the hybrids made in 1936 were tested for yield and popping volume. Many new hybrid combinations were made. The three-way hybrid Iojap, released for field trial in 1937, was well received, and was released for further trial in 1938.

In addition to the above breeding work, certain genetical experiments were also carried out. The gene for knotted leaf, *Kn*, was found to be located between *f*₁ (fine stripe 1) and *bm*₂. Data from a four-point experiment are given. Linkage experiments involving the gene *g*₂ for golden plant colour are also in hand.

Comparisons are being made between selfing and brother-sister mating as methods of fixing desirable gene combinations.

Growth curves are given, in which the relative growth rates of inbred and hybrid corn are compared. It is concluded that there is no appreciable difference in growth rate between the two, the difference in plant size being due to the fact that the hybrid has a larger initial plant weight.

In certain reciprocal crosses, maternal inheritance of tillering was observed: this is attributed to better development of the embryos borne on the parent with more tillers.

Investigations were conducted on the relationship between virulence of the bacterial wilt organism and resistance of the host variety, and between resistance and various manurial treatments.

726. KÖSZL, O. 633.15:575.12:581.162.3
Die Heterozygotie als Mittel zur Sicherung und Steigerung der Maiserträge.
(**Heterozygosity as a means of ensuring and increasing the yield of maize**).

Wien. landw. Ztg 1938 : 88 : p. 83.

In order to ensure pollination and thereby a more certain yield, a number of crosses were made between varieties with different flowering periods.

The hybrids showed increased yield.

727. CAPINPIN, J. M. and PADILLA, E. B. 633.15:575.125:575(91.4)
The value of first generation hybrids of Native Yellow Flint corn.
Philipp. Agric. 1938 : 27 : 405-25.

Crosses were made between different open-pollinated strains of Native Yellow Flint maize, and the F₁ populations compared with the parents. The hybrids showed an increase in height of plants and in ear length. Three out of the six hybrids studied showed increases in yield over the better parent, ranging from 7.9 to 25.0 per cent. Since the cost of producing hybrid seed is very low in the Philippines, it is concluded that this method is a very promising one of obtaining increased returns for a small outlay.

728. BRIEGER, F. G. 633.15:575.125"793"
 Hybridos de milho com referencia especial a' precocidade. (Hybrids
 of maize with special reference to earliness).
 Rev. Agric. S. Paulo 1938 : 13 : 348-60.

Photographs and descriptions of hybrid plants are presented in illustration of the heterosis that occurs when two unrelated lines are crossed and of the reduction in vigour that occurs in subsequent inbred generations. Both as regards vigour of the plant as a whole and of the cob in particular, certain combinations occurred in which there was no heterosis, the hybrid being intermediate, and in still others the one character displayed heterosis and the other was intermediate.

Data are also given for the earliness of the hybrids in comparison with the parents; here again some F_1 hybrids were earlier than both parents, some matured with the earlier parent and others were almost but not quite as early as the early parent; no hybrid later than the late parent was observed. Some combinations which in Brazil showed marked heterosis gave under English conditions only dominance of earliness.

729. O'MARA, J. G. 633.15:575.127.5:576.312
 Cytological observations on *Zea-Euchlaena* hybrids.
 Genetics 1939 : 24 : 82-83. (Abst.).

The hybrid *Zea mays* x *Euchlaena mexicana* has generally been found to be unfavourable material for cytological study at the pachytene stage, owing apparently to the influence of the *Euchlaena* parent. Ten varieties of *E. mexicana* were examined, and those which gave the best pachytene preparations were crossed with maize. A teosinte from Mexico and one from Guatemala both gave good pachytene material, the latter being equal to the best stocks of maize.

The Mexican teosinte varieties examined all had non-terminal knobs, whereas in all the Guatemalan varieties terminal knobs were found. In crosses with maize, the Mexican variety mentioned above showed apparently complete homology and regular disjunction. The knobs found occurred at the same loci as the corresponding knobs in maize, except for a small knob on the short arm of chromosome II. The Guatemalan variety also showed complete homology and regular disjunction.

It should be of particular value in certain cytogenetic studies to which maize is not adapted, since most of the chromosome arms have terminal markers. These two teosinte varieties do not show the heteromorphic homologues found in certain other maize-teosinte hybrids.

730. JONES, D. F. 633.15:575.247.061.6:581.48
 Variable effect of the *C* locus in maize following translocation.
 Genetics 1939 : 24 : p. 100. (Abst.).

The paired dark and colourless areas in the aleurone layer of maize are due to segmental shift at the *C* locus. The normal effect of an increase in the number of *C* genes is an increase in density of colour, but in a few cases chromosomal shift in the *C* region has been observed to give a lighter colour instead of a darker, e.g. colourless areas have been found paired with areas lighter than the surrounding normal cells. It appears that in such cases the translocated *C* region not only fails to function as usual, but also prevents the normal action of the other *C* gene, i.e. it may act as a partial inhibitor of colour. This is significant in view of the fact that one of the known allelomorphs at or near the *C* locus is a colour inhibitor that is variable in its action in different lines.

731. AKEMINE, T. 633.15:576.16
 [Chromosome behaviour in the intergeneric hybrids of *Tripsaceae*
 (A collective review)].
 Jap. J. Genet. 1938 : 14 : 66-73.

In this survey, which is accompanied by a bibliography, the writer supports the geneticists' and cytologists' claim that *Zea* and *Euchlaena* should be combined in one species.

Having examined the available information on the cytology of the hybrids between *Zea* and *Euchlaena* (including tetraploids from this cross), and hybrids between *Tripsacum*

and *Euchlaena* and between *Tripsacum*, *Euchlaena* and *Zea*, the author concludes that *Zea* and *Euchlaena* are very closely related and that *Tripsacum* is considerably less closely related to either of these two genera.

732. 633.15:576.16
633.15:575.127.5
 LANGHAM, D. G.
The inheritance of intergeneric differences in *Zea-Euchlaena* hybrids.
 Genetics 1939 : 24 : p. 78. (Abst.).

Evidence is presented to support the theory that maize evolved from teosinte by mutation. Extensive genetic investigations show that the characters, paired v. single spikelets, many-ranked v. two-ranked ear, and weak v. strong response to length of day are inherited as simple genetic characters. In inbred lines of maize, mutation back to teosinte characters occurs occasionally, and these mutations have been shown to be allelomorphic with the corresponding teosinte forms by test crosses with teosinte. The mode of origin of the maize ear is discussed.

733. 633.15:576.354.46:576.356.4
 MATHER, K.
Chiasma frequencies in trisomic maize.
 Genetics 1939 : 24 : p. 104. (Abst.).

Inter-chromosome interference, as judged by the negative correlation of chiasma frequencies, is lessened in maize plants carrying an extra short arm of the fifth chromosome, and the chiasma frequency is correspondingly increased. Less complete data on other trisomic strains agree with these results, which show that the upper limit to the number of chiasmata in a nucleus is related to the number of chromosomes present.

734. 633.15:576.356:575.11
633.15:575.24:535.61-31
 CLARK, F. J.
A gene for abnormal meiotic spindle formation in maize.
 Genetics 1939 : 24 : p. 68. (Abst.).

A number of plants with atypical spindle formation at metaphase I were isolated from the F_2 of a cross in which the pollen grains of the male parent had been treated with ultra-violet radiation. Meiosis proceeds normally until anaphase I, when the chromosomes do not converge into a polar cluster, but diverge to form several small nuclei at telophase I. This is due to the fact that the "spindle fibres" diverge at the poles instead of converging, the chromosomes following the divergent paths. At the second division several separate spindles, variously orientated, are produced, resulting in a variable number of spores with one or more nuclei each. Spores which have at least a complete set of chromosomes, though in several separate nuclei, are capable of apparently normal growth, and at the first microspore division the spindles produced by their nuclei may be orientated in the same direction, so that a single tube nucleus and a single generative nucleus are produced. From 30 to 60 per cent of the pollen is aborted. The character is inherited as a simple recessive.

735. 633.15:581.143.26:575.24:581.483
 JONES, D. F.
Growth changes associated with chromosome breakage and re-attachment.
 Genetics 1939 : 24 : p. 77. (Abst.).

Growth alterations in maize endosperm result in raised or depressed areas which may be paired or single. They are relatively rarely associated with colour changes resulting from the loss or shift of known genes, so that it appears that they are not a manifestation of the action of the colour genes themselves. It appears, too, that they are not due to changes in loci in the same chromosomes as the colour genes, otherwise there would be a higher association between the two phenomena. It is suggested that such growth changes are due either to a chromosomal unbalance that is not lethal or to a physiological change at points of chromosome breakage and reattachment.

736. TAVČAR, A. 633.15:581.162.3:581.46:575
 Schlechter Kornansatz am oberen Kolbenteil bei Mais und seine
 Einschränkung durch Züchtung und künstliche Bestäubung. (**Poor
 setting in the upper part of the cob of maize and its limitation by
 means of breeding and artificial pollination**).
 Züchter 1938 : 10 : 325-31.

The author's observations showed that there is frequently a poor set of seed in the upper part of the maize cob, especially when periods of heat and drought occur at flowering time. An analysis is given of the conditions under which pollination occurs and it is shown that varieties differ considerably in the amount of seed set. Varieties with a good set can be produced by selection or by means of artificial pollinations, two methods for which are described, by means of which an increased set may be obtained.

737. JOHNSON, I. J. and 633.15:581.175.11:581.483
 MILLER, E. S. 633.15:575.183
**Immediate effect of cross pollination on the carotenoid pigments in
 the endosperm of maize.**
 Cereal Chem. 1939 : 16 : 88-92.

Analyses were made of the percentage of carotinoid pigments in the endosperm of 35 inbred lines of maize. Significant differences in this respect were observed between the lines, the range being from 0.89 to 2.57 mg. per cent. Lines with a light yellow endosperm in general contained more carotinoid pigment than those which were dark yellow. Though the range in each case was large, there is thus a possibility of selecting inbred lines in the field for high vitamin A content.

It was shown, by analysis of the endosperm of crosses between inbred lines with widely differing carotinoid pigment contents, that the male parent has a direct influence on the amount of such pigments in the seed.

There was no significant correlation between the percentage of carotinoid pigments in the leaf tissues of inbred lines and the percentage in the endosperm.

738. MILLER, E. S. and 633.15:581.192.2:575
 JOHNSON, I. J. 635.67:581.192.2:575
**The relation between leaf tissue pigment concentration and yield
 in corn.**
 J. Amer. Soc. Agron. 1938 : 30 : 941-46.

In a study of various inbred lines and F_1 hybrids of Golden Bantam sweet corn, it was found, *inter alia*, that there was no significant correlation between yield and chlorophyll content of the leaves. The latter character is therefore of no use to the plant breeder in determining the yielding ability of maize varieties.

739. LINCOLN, R. E. and 633.15-2.3:575.24:575.41
 LINDSTROM, E. W.
**Micro-evolution of host-parasite interactions in bacterial wilt
 of maize.**
 Genetics 1939 : 24 : p. 78. (Abst.).

LINCOLN, R. E.
Host-parasite interactions with bacterial wilt of maize.
 Science 1939 : 89 : 159-60.

Homozygous wilt-resistant and wilt-susceptible inbred lines of maize were inoculated with strains of *Bacterium Stewartii* of high and low virulence which also differed morphologically in colony characters, obtained from single cell isolations. With continuous passage bacterial virulence increased in the resistant and decreased in the susceptible host, the change being attributed to genetic mutation and subsequent selection of the parasite.

When inoculation was effected with mixed cultures of high and low virulence, passage through the resistant host resulted in an increase in the proportion of the virulent type, while in the case of the susceptible host the proportion of the virulent type decreased. The change was

more rapid than in the case of single spore cultures, and is attributed to differential selection of the parasite in the two types of host.

BARLEY 633.16

740. GUSTAFSSON, Å. 633.16:537.531:576.353
 Der Tod als ein nuklearer Prozess. (Death as a nuclear process). 633.16:575.243.061.634:581.01
 Hereditas, Lund 1937 : 23 : 1-37.

Following on the researches summarized in Abst. 741 below, the author considers in more detail the effect of increasing age on the susceptibility of barley grains to X-ray irradiation. He points out that resting seeds are not really resting, since the vital processes are still continuing in them, though at a much reduced rate, and considers that the resting nuclei slowly approach the stage at which "potential reproduction" of the chromosomes (i.e. division of single threads into two chromatids) occurs. If the water content is subsequently not high enough for a mitosis to be completed, these nuclei soon degenerate and die. The cycle is completed most quickly in the cells which have the highest water content in the resting stage.

In the oldest seeds X-rayed, the frequency of albinotic mutants in proportion to other chlorophyll mutations was higher than in newer material. It is concluded that this is because the genes determining albinism are on the average associated with fewer chromosome disturbances than other mutations, so that gametes containing them have a greater chance of functioning to form zygotes.

741. GUSTAFSSON, Å. 633.16:537.531:576.353
 The different stability of chromosomes and the nature of mitosis.
 Hereditas, Lund 1937 : 22 : 281-335.

Samples of dormant seeds of Gullkorn barley of differing ages and water contents were subjected to X-ray irradiation for from two to three hours. The seeds were subsequently germinated and the root-tips examined cytologically when their nuclei were undergoing what was believed to be the first mitosis after dormancy.

The types of chromosome fragments and fusions observed are described. Occasional fragments were found in which the two chromatids had been broken at different loci, but a scheme is presented to show that these do not necessarily conflict with the hypothesis that the chromosomes are present as single threads in the resting stage.

It is shown that the nuclei which commence to divide first after germination show the highest percentage of disturbances due to irradiation. The author concludes that these nuclei were able to divide first and were also more susceptible to X-rays because their chromosomes had become double. As this increased sensitivity applies only to a very small proportion of the total number of nuclei, he concludes that the "split" in the chromosomes occurs near the end of the resting stage.

A higher water content in the nuclei is associated with a higher percentage of disturbances;—it is considered that a high water content favours the occurrence of the "split."

The relative rate of division of different groups of nuclei is studied, as also is the effect of storing the seeds for a time after irradiation and before germination. Increasing age of seed is correlated with an increase in the amount of disturbance caused by X-rays.

The author considers that his results are entirely in support of the single thread conception of the chromosomes of the resting nucleus, the "split" occurring just before the prophase of mitosis.

742. ROTHGEB, R. G. and 633.16:575(75.2)
 KEMP, W. B. 633.16:581.46:575
 Winter barley in Maryland.
 Bull. Md Agric. Exp. Sta. 1938 : No. 416 : 239-57.

A description is given of the cultural requirements and distribution of barley in Maryland. Utilization of the crop and its diseases are also discussed.

The variety Tennessee Winter is the most widely grown in Maryland. It is very winter-hardy, but has rough awns, parts of which frequently adhere to the grain after threshing. This character is very objectionable, and an attempt has been made to select suitable smooth-awned forms from the cross Tennessee Winter x Velvet. Two selections have now been released, Marnobarb (previously known as selection 13-6), and 19-8. Selection 15-8 has also been extensively tested. These varieties have awns practically free of barbs, and have out-yielded Tennessee Winter at the Maryland Experiment Station. Their straw is taller and much stiffer than the control variety, but they are rather less winter-hardy, and therefore cannot be recommended for regions of the state where winter-killing is a serious factor.

743. HILL, D. D.,
STEPHENS, D. E.,
RICHARDS, D. E.,
HUTCHISON, R. E. and
MARTIN, J. F. 633.16:575:663.421(79.5)
Barley production in Oregon.

Sta. Bull. Ore. Agric. Exp. Sta. 1938 : No. 355 : Pp. 34.

Oregon Agricultural Experiment Station commenced work on the breeding of improved malting barleys in 1933. A large number of new hybrid varieties have been produced and are being tested for yield and malting quality. The results of some of these trials are appended.

744. 633.16:575.115
633.16:575.125:581.143.26.035.1
633.842:575.125
KRAJEVOJ, S. J.
(**Some regularities observed in plant hybridization**).
Bull. Acad. Sci. U.R.S.S., Sér. Biol. 1938 : 399-426.

Forms of *Hordeum sativum* var. *nutans* from Canada crossed with a form from Asia Minor gave seeds exceeding the latter, larger parent in size. Certain other crosses gave similar results, and in most the larger parent was dominant. Later observations indicated that the seeds showing heterosis gave rise to plants also characterised by heterosis.

A great many crosses were made between forms of different geographical origin and here again it was found that the larger parent tended to be dominant, both in crosses between forms of the same botanical variety and in crosses of different botanical varieties. Heterosis occurred when the parents were from different latitudes but not otherwise, regardless of whether they belonged to the same or to different botanical varieties. The decisive factor is thought to be the different length of day under which forms in different latitudes have evolved, giving rise to forms of different physiological types which prove mutually complementary on crossing. Heterosis was also observed in crosses between a tall and dwarf form of pepper (*Capsicum annuum*) and in a number of other crosses the taller form was invariably dominant and an extensive examination of the literature, involving some 185 references, the results of which are tabulated, tends to the same general conclusion.

745. 633.16:576.16
ÅBERG, E. 633.16 *Hordeum agriocrithon*
***Hordeum agriocrithon nova* sp., a wild six-rowed barley.**
Lantbrukshögskolans Annaler 1938 : 6 : 159-216.

A detailed description of a wild, six-rowed species of barley found in Eastern Tibet. Its brittle rachis differentiates it from all cultivated species and the fully fertile florets in all six rows distinguish it from *Hordeum spontaneum*. It has 7 *n* chromosomes. Further study is needed before the importance of the new species to the phylogeny of the genus *Hordeum* is discussed.

746. KARPECHENKO, G. D. 633.16:576.356.5:581.036.1
(**Tetraploid barleys obtained by high temperature treatment**).
Biologičeskij Žurnal (Biologicheskij Zhurnal) 1938 : 7 : 287-94.

The varieties Viner 01163, Europeum 0353/133, Pallidum 032 and Line A from var. Dundar-bey; Zhuk. x var. Nigrinudum R. Reg. were emasculated when flowering began, pollinated each

by their own variety and then subjected for 20 hours to a temperature 25–26° C. after which they were kept for a half, three quarter or a whole hour at 43–50° C. before being returned to the greenhouse. From 180 ears (2511 florets) thus treated 147 ears (2128 florets) survived and 637 seeds were collected from which 378 plants were raised, the chromosome numbers of which were determined from root tips. In 22 plants whole or portions of root tips showed the double chromosome number. In four other plants tetraploid tissue in the ears was subsequently found from a study of meiosis.

The different varieties varied in susceptibility to temperature; Viner 01163, which produced 23 plants with tetraploid tissue, was most susceptible at 46° C. for one hour.

A detailed examination of 24 plants showed that 11 had diploid and tetraploid root tips but only diploid stems, while those with tetraploid root tips and stems numbered 3.

The treatment is held to be most effective in barley when given 18–19 hours after pollination. In Viner 01163 and Europeum 0353 133 the tetraploids had stouter straw, broader leaves and larger ears and grains and coarser husks, but the ears show a certain number of undeveloped grains—a phenomenon attributed to irregularities in meiotic division. The large grains were also found in ears with only one or two empty spikelets. Though as a rule the pollen grains of the tetraploids was larger than in the diploids, they were of less uniform size.

Out of 22 F₂ plants examined 19 were tetraploid, two had 29 chromosomes and one had 27 chromosomes.

Hybridization of tetraploids *inter se*, accompanied by appropriate selection, is considered as an appropriate means of increasing their fertility.

A few unsuccessful intergeneric crosses have already been made in which tetraploid barleys have been used to pollinate the main species of wheat.

MILLETS AND SORGHUMS 633.17

747. IRELAND, J. C. 633.174:575.061:581.45
Heritable variations in chlorophyll.
 Plant Physiol. 1938 : 13 : 863–65.

Spectrographic differences between chlorophyll extracts of ten head-to-row plantings of sorghum varieties were constant throughout the season and throughout two generations. The differences were not related to differences in chlorophyll concentration or in concentration of sugars.

748. STEPHENS, J. C. and QUINBY, J. R. 633.174:575.116.1
Linkage of the Q B Gs group in sorghum.
 J. Agric. Res. 1938 : 57 : 747–57.

The factor pairs *Qq* (reddish v. blackish plant colour, shown in the mature glumes and in injured tissue throughout the plant), *Bb* (presence v. absence of brown nucellar layer) and *GsGs* (normal green v. green-striped chlorophyll deficient plants) are reported to be linked, the order of genes and cross-over percentages being *Q* (13.2) *B* (11.3) *Gs*.

One or more members of this linkage group showed independent inheritance, or cross-over values so high that linkage could not be detected, with respect to each of the following factor pairs: presence v. absence of spreader (*Ss*), coloured v. white seed (*Rr*) awnless v. awned lemmas (*Aa*), dry v. juicy stalks (*Dd*), red v. green seedling stems (*Rsr*s), normal v. antherless flowers (*Alal*), starchy v. waxy endosperm (*Wwx*), green v. virescent yellow seedlings (*V₂v₂*) and twin-seeded v. single-seeded spikelets (*Tsts*).

RICE 633.18

749. CHIAPPELLI, R. 633.18:575(45)
 633.18 Strain 136 C
 Una nuova varietà di riso al campo sperimentale—Stirpe 136 C. (**A new variety of rice in the experimental plots. Strain 136 C.**)
 G. Risicolt. 1938 : 28 : 206–08.

A description of a new variety, 136 C, from a natural cross between Lady Wright and Chinese Ostiglia.

750. PIACCO, R. 633.18:575(45)
Varietà di riso ottenute per ibridazione artificiale alla Stazione di Riscoltura.
(Varieties of rice obtained by artificial hybridization at the Stazione di Riscoltura).
Riscoltura 1939 : 29 : 11-20.

From innumerable crosses between Italian rices, Italian rices with foreign rices and between foreign rices, the following crosses have produced satisfactory hybrids: Nano x Lady Wright—from this cross the variety Greggio has been named and its characters are described. Nano x Vialone—Var. 12 has been distributed. Vialone x Americano—the variety Oldenico from this cross is described. Nano x Chinese Ostiglia—the best hybrid is Agostano. Mantova x Vialone—two varieties, Var. 10 and Var. 11 are described.

751. 633.18:576.312.315:576.312.38
PARTHASARATHY, N. 633.18:576.312.35
Cytological studies in Oryzeae and Phalarideae. II. Further studies in *Oryza*.
Cytologia, Tokyo 1938 : 9 : 307-18.

Several Japanese and Indian varieties of rice were examined, and in both groups varieties were found with four and with two nucleoli at somatic telophase. It is supposed that the number of nucleoli in each case corresponds with the number of satellited chromosomes. Data on secondary pairing at metaphase I in rice are presented. These confirm the conclusion that *Oryza sativa* is a secondary polyploid with a basic chromosome number of five. The chromosome number of *Oryza coarctata* is reported as $2n = 48$.

752. SAKAI, K. 633.18:576.356:581.036
(Interfering effects of low temperature upon the microsporogenetic cell division in rice plant).
Proc. Crop Sci. Soc. Japan 1937 : 9 : 207-12.

Disturbances occurred at temperatures below 15°C . in cell division of pollen mother cells of lowland rice grown in Hokkaido, where a temperature of 15°C . is now and then recorded even in mid-summer. This temperature coincides on the whole, with the minimum temperatures for germination, flowering, tillering and other phases of plant growth.

753. JONES, J. W. 633.18:581.6:578.088.1
The "Alkali test" as a quality indicator of milled rice.
J. Amer. Soc. Agron. 1938 : 30 : 960-67.

A simple test for quality which would permit the rice breeder to make selections for this character in the early stages of breeding would be of great value. Milled rice grains were placed in a dilute potassium hydroxide solution and the nature of their disintegration was observed. There is evidence of some degree of correlation between cooking quality and the type of disintegration, although in some varieties the results were inconsistent. Grains which disintegrate with opaque masses in general appear to be of lower cooking quality than those that disintegrate into clear or intermediate masses.

754. PIACCO, R. 633.18:582(45)
Classificazione botanica delle varietà di riso italiane. (A botanical classification of the Italian varieties of rice).
Ital. Agric. 1938 : 75 : 717-20.

On the basis of ten botanical characters a key is provided for the identification of the varieties of rice, *Oryza sativa* subsp. *communis*, cultivated in Italy.

755. 633.18.0014(92.2)
VROON, L. J. 633.18-1.524.4:575.42(92.2)
De medewerking van den Provinciaal Landbouw-voorlichtingsdienst van West-Java aan het rijstvarieteitenonderzoek. (The co-operation of the Provincial Agricultural Service in West-Java in variety tests of rice).
Landbouw 1938 : 14 : 669-89.

An account is given of selection work with indigenous and other varieties and of trials

carried out to meet the requirements of native growers in regard to yield and adaptation to conditions in various regions. The roles of mass and line selection in this rice improvement programme are mentioned. A table is given showing for a 3-year period the area planted with the new varieties that have been produced.

HERBACEOUS AND LEGUMINOUS FORAGE PLANTS 633.2/3

756. CUGNAC, A. de and BELVAL, H. 633.289:575.127.5:633.289:581.192
 Nature du glucide d'un hybride obtenu entre deux genres de Graminées différant par leurs réserves glucidiques. (**The nature of the carbohydrate of a hybrid obtained from a cross between two genera of Gramineae differing in their carbohydrate reserves**).
 C.R. Acad. Sci. Paris 1939 : 208 : 377-79.

The male parent, *Agropyrum caninum* Roem. et S. contains a carbohydrate "triticine," the female parent, *Elymus reparius* Wiegand, contains "elymoside." The hybrid *Agroelymus* Piettei A. de Cugnac appeared to contain only "triticine."

757. BURTON, G. W. 633.311:575.127.2:633.312:575.11
The inheritance of various morphological characters in alfalfa and their relation to plant yields in New Jersey.
 Bull. N.J. Agric. Exp. Sta. 1937 : No. 628 : Pp. 35.

Observations in the field suggest that an important factor for the success of alfalfa in New Jersey is resistance to heaving injury. *Medicago falcata* L., a yellow flowered, low-yielding alfalfa with a branched root system and a prostrate growth habit has been crossed with varieties of *M. sativa* L. and the present paper reports correlation studies on F_2 and F_3 progenies of *M. falcata* x Hairy Peruvian and an F_2 progeny of *M. falcata* x Hardigan. The correlation ratio was used as a measure of association.

In the first cross association of yield with leaflet shape and leaflet area is taken as an indication of linkage, the high yield of Hairy Peruvian being considered linked with narrow, large leaflets. High seed yield was correlated with high vegetative yield, which was also slightly correlated with branched root system, showing that the branched root system of *M. falcata* could be combined with the high yield of Hairy Peruvian. High leaf percentage seems to be associated with medium yield. The erect habit of growth of Hairy Peruvian was dominant in the F_1 and in a field of 285 F_2 plants the prostrate habit of *M. falcata* was not recovered. In an F_2 progeny of 100 plants grown in the greenhouse from the *M. falcata* x Hairy Peruvian (purple flowered) 3 yellow flowered plants occurred, while among an F_2 of 461 plants from the cross with Hardigan (variegated flowers) there were 10 yellow flowered plants. This is taken as evidence that flower colour is controlled by three factors. Most of the characters studied gave normal distributions, indicating multifactorial inheritance.

Several points of practical interest emerge from the correlation studies and from observations on selected F_3 progenies. A population of Kansas Common alfalfa was also subjected to correlation analyses.

J. L. F.

758. KLINKOWSKI, M. 633.367-1.524:575
 633.376-1.524:575
 Die Bedeutung der Iberischen Halbinsel für die deutsche Pflanzenzüchtung.
 (**The importance of the Iberian peninsula for German plant-breeding**).
 Ernähr. Pfl. 1939 : 35 : 9-13.

Lupins and serradella are indigenous in the Iberian peninsula. Both are recent additions to German agriculture and while the value of lupins has been greatly increased by the breeding of strains of sweet lupins, hardly any breeding work on serradella has been done since its introduction.

A study of the various forms found in Spain and Portugal is therefore likely to be of considerable interest in the creation of new and improved varieties.

A collection of seed has been made and the new possibilities will be explored.

ROOTS AND TUBERS 633.4

759. FRANDSEN, K. J. 633.41:576.356.5:581.04
Colchicininduzierte Polyploidie bei *Beta vulgaris* L. (**Polyploidy in *B. vulgaris* L. induced by colchicine**).
Züchter 1939 : 11 : 17-19.

Strains of the yellow and white forage sugar beet were treated with colchicine. All shoots were removed from the top of the beets, which were then planted in pots and the upper parts painted with a lanoline paste containing about 1 per cent of colchicine. Some of the resultant shoots were much deformed but most were normal. From 10 treated roots, two shoots from different beets were markedly stronger and proved to be tetraploid with 18 chromosomes in the second meiotic metaphase of the pollen mother cells.

The tetraploid shoots showed stronger vegetative growth but were later in flowering and had fewer flowers than the diploid.

It should be possible to make crosses between the two tetraploid plants.

760. HAGA, T. 633.42:576.356.5
[**On genomes in the genus Brassica. (A collective review)**].
Jap. J. Genet. 1938 : 14 : 74-90.

A survey of the findings of various investigators, including the author's own work on the subject (Cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 1222). There is an extensive bibliography.

761. ESCH, J. A. H. 633.491:575(49.2)
Het kweken van nieuwe aardappelvariëteiten en hetgeen daarmee verband houdt. (**The breeding of new varieties of potatoes and its implications**).
Landbouwk. Tijdschr. Wageningen 1938 : 50 : 940-50.

The first part of this paper deals with the organized measures adopted in Holland to promote the production of new disease resistant varieties of potatoes.

The second part deals with the well known problems of the origin of new varieties from bud mutations or from seed obtained by selfing or hybridization; also with fertility and variation.

It is suggested that in order to eliminate from potato breeding the practice of making crosses at random without knowledge of previous workers' results, that a pedigree register for potatoes should be established and maintained under expert supervision. In this way the crosses made by breeders could be annually recorded and the results brought to the attention of all breeders. The value of the existing annual Descriptive List of Varieties (Cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 1090) in this connexion is also indicated.

In conclusion some hints are given to breeders on the technique of raising potato seedlings.

762. 633.491:575(71.5 + 74.1)
STEVENSON, F. J. 633.491-2-1.521.6:575
Potato conference at Presque Isle, Maine, and Fredericton, New Brunswick.

Amer. Potato J. 1938 : 15 : 277-84.

In this report of a discussion of potato problems which took place at the above conference, the breeding methods and objectives of several American workers are briefly described.

763. 633.491:575(73)
JONES, H. A. 635:575(73)
Plant breeding as applied to vegetable improvement.
Rep. Proc. 28th Annu. Mtg Nth Nut Gr. Ass. Md and Wash., D.C. 1937 : 78-83.

A brief survey of the ways in which the plant breeding method has been applied to improvement of potatoes, onions, lettuce and cantaloupes in the United States.

764. STEVENSON, F. J. and CLARK, C. F. 633.491:575(73)
The national potato breeding program, 1937.

U.S. Dep. Agric. Bur. Pl. Ind. Pp. 41. (Mimeographed).

In this report, the potato breeding work being conducted by the United States Department of Agriculture and by various co-operating states is outlined. The national potato breeding programme is very wide in its scope. Promising seedlings produced at any one station are freely distributed to other centres, so that much of the work in progress involves the testing of such seedlings for local adaptability and disease resistance.

The seedlings may either be produced from open-pollinated seed, from hybrids between ordinary potato varieties, or from crosses between inbred lines. Selection for resistance to a large number of diseases is in progress, and this aspect of the work is of the first importance. Resistance to late blight, common scab, *Fusarium* wilt, and various virus diseases is being sought, and in most cases considerable success is being retained.

At some stations clonal selection of established varieties is being conducted in addition to hybridization work and the testing of new seedlings.

The report contains details of the behaviour of important new varieties, such as Earleine, Katahdin and Chippewa, in various parts of the United States.

765. BUSHNELL, J. 633.491:575(77.1)
New varieties of potatoes introduced by the U.S. Department of Agriculture.

Proc. 23rd Annu. Mtg Ohio Veg. Gr. Ass. 1938 : 101-02.

Some of the potato varieties bred by the U.S. Department of Agriculture in Maine are each year sent to Ohio for testing in that state. Data relating to yield, time of maturity and quality are given for the six best lines out of fifty tested in 1937, compared with Russet Rural as standard. No. 47101 is particularly promising, having the highest yield and also the highest quality of those tested.

766. CLARK, C. F. and STEVENSON, F. J. 633.491:575"793"(73)
 633.491 Earleine
The Earleine potato, a new early variety.

Circ. U.S. Dep. Agric. 1938 : No. 493 : Pp. 6.

The Earleine variety of first-early potato is described and illustrated, and its pedigree given. It is very highly resistant to mild mosaic under field conditions, and produces good crops of smooth, uniform tubers of attractive appearance in the regions where it is adapted. It should be of special value to the plant breeder, since it has an abundance of fertile pollen, whereas other American first-early varieties have almost entirely sterile pollen.

767. RATERA, E. L. 633.491:576.312.35(82)
 Determinación del número de cromosomas de varias especies de papas indígenas de la República Argentina. (**The determination of the chromosome number of various species of potatoes indigenous to the Argentine Republic.**)

Inst. Genét. Fac. Agron. Vet. Univ. B. Aires 1938 : 1 : Fasc. 1 : Pp. 8.

The following species were investigated: *Solanum laplaticum* Buk., *S. Millanii* Buk. et Lechn, *S. Parodii* Juz et Buk., *S. Horovitzzi* Buk., *S. gibberulosum* Juz et Buk., *S. Garciae* Juz et Buk., *S. Henryi* Buk. et Lechn, and eight *Solanum* species belonging to the section Tuberarium. In each case the haploid number in the pollen mother cells was 12.

The Argentine is regarded as a centre of origin of the potato, and other workers have found species with 36 and 48 somatic chromosomes.

768.

633.491:576.312.35:576.354.4

BAYLISS, R.

633.491:581.481

(On the cytology and embryology of *Solanum citrullifolium* A. Br. and *Solanum Balbisii* hort.).

J. Inst. Bot. Acad. Sci. Ukraine 1938 : No. 17 (25) : 113-17.

Solanum citrullifolium and *S. Balbisii* are both diploid species, with $n = 12$. Meiosis proceeds normally on both the male and female sides, and the embryological development is also normal. A single case of polyembryony was found in *S. citrullifolium*, three embryos appearing in one embryo sac.

769.

FILINNOV, A.

633.491-1.541.1:575

(On vegetative hybridization of the potato).

Plodovoščnoe Khozaistvo (Fruit and Vegetable Growing) 1938 : No. 11 : 26-31.

Various views on the relation between scion and stock are discussed with emphasis on the work and theories of Michurin and Lysenko. Then from the author's own experiments instances are cited of variations in the mode of branching, the leaves, fertility, colour and structure of tubers, and time of tuber formation in grafted potato plants, all due to the interaction between scion and stock. The influence of grafts of an early variety in hastening tuber formation in a normally late variety used as the stock was clearly seen in experiments with Early Rose and Wohltmann.

Analogous results were obtained from 58 different combinations. The earlier the scion the more rapidly did the stock begin to form tubers.

Where wild species were grafted upon early varieties, the stock formed no tubers for 170 days though tuber formation in the controls began 100-120 days earlier. The converse relationship was shown when the wild species were used as the stock.

The short day species, *Solanum demissum* and *S. acaule*, when Early Rose or Epicure had been grafted on to them produced large tubers 60-70 days after planting out and 30-40 days after the grafting operation, while the controls—grafts of wild type on wild type—had formed no tubers in 200 days.

Further observations made upon plants raised from early tubers obtained as described above showed that such plants might exhibit characteristics derived from the scion as well as those from the stock; and intermediate characters also occurred. In addition, from the grafts of Early Rose, Epicure and Lorkh upon *Solanum demissum*, plants totally unlike the original wild form were obtained: some were like the original form, others intermediate in type and others showed a marked resemblance to the cultivated form. In fact the progeny were (adopting the author's terminology) true "vegetative hybrids". Similar results were obtained by F. S. Solodovnikov in conjunction with the author. Tubers from the plants thus obtained by grafts of cultivated varieties upon *S. demissum*, and vice versa, are to be used for further study and for multiplication.

770.

633.491-2-1.521.6

DORST, J. C.

633.52:575(49.2)

Over het kweekveld der Friesche Maatschappij van Landbouw te Engelum. (On the breeding plots of the Friesian Agricultural Society at Engelum).

Tijdschr. PlZiekt. 1938 : 44 : 277-79.

Among the new strains of potatoes that have been raised of recent years at Engelum are Alpha, Furore, Iris and Komeet.

Four strains of flax have been put on the market namely Alba, Bella, Concordia and Concurrent and a new broad bean, the Adrie, has been produced.

In addition to yield and quality in potatoes much attention is directed to the search for disease resistant types, and especially among the widely grown varieties Eersteling, Bintje, Eigenheimer, Zeeuwsche Blaue and Thorbecke. Hybrid progeny are also tested and have shown differences in disease resistance.

Similar work is being done on differences in disease resistance in flax strains. It is suggested that the elimination of stem discoloration occurring towards the end of the growth period or at harvest should also be considered in improvement work.

771. LUNDEN, A. P. 633.491-2-1.521.6:575
Mål og metoder ved foredlingsarbeidet for sykdomsresistens hos poteten (*Solanum tuberosum*). [Objects and methods in the breeding for disease resistance in the potato (*S. tuberosum*)].
Meld. Norg. LandbrHøisk. 1938 : 18 : 183-98.

A survey of the methods and results of breeding varieties of potato resistant to disease. Experience has shown that resistant varieties are the most effective control for potato diseases and the data on the various diseases are reviewed.

772. CLARK, C. F., STEVENSON, F. J., and SCHAAL, L. A. 633.491-2.3-1.521.6:575(74.1)
633.491-2.3-1.521.6:575.116.1:581.446.2:575.061.5
The inheritance of scab resistance in certain crosses and selfed lines of potatoes.
Phytopathology 1938 : 28 : 878-90.

The exact mode of inheritance to common scab (*Actinomyces scabies*) in the potato varieties studied is not yet worked out, but information of considerable interest to the plant breeder has been obtained. The Green Mountain variety appears to be homozygous for susceptibility. Katahdin is susceptible but carries one or more genes for resistance in the heterozygous condition. Hindenburg and Ostragis appear to be homozygous for resistance, while Seedling No. 44537 and Richter's Jubel are heterozygous for resistance. There is a genetic linkage between resistance to scab and russetting, but in one cross at least, resistance was independent of the factors for red v. white tubers.

A number of highly resistant white skin potato seedlings have been produced by hybridization and selection. Some of these approach commercial varieties in vigour and yield but are inferior in other characters. There is every reason to believe however, that resistant varieties desirable in other respects can be produced by using these resistant sorts as parents in crosses.

773. GRECHUSHNIKOV, A. 633.491-2.411.4-1.521.6
577.15
(The significance of the sistoamylase in the potato immunity to *Phytophthora infestans* De Bary).
Symposium dedicated to the memory of V. N. Lubimenko. Acad. Sci. Ukr. S.S.R. Inst. Bot., Kiev 1938 : 309-13.

Tests showed that the cultivated potato, some wild species and also various hybrids of *Solanum tuberosum* x *S. demissum* contained sistoamylase, a substance which is stated to be broken down when the plant is infected with *P. infestans*.

A relationship is held to exist between the sistoamylase content and resistance to *P. infestans*.

774. STEVENSON, F. J. and CLARK, C. F. 633.491-2.411.4-1.521.6:575(74.1)
633.491-2.8-1.521.6
The Sebago potato, a new variety resistant to late blight.
Circ. U.S. Dep. Agric. 1938 : No. 503 : Pp. 7.

Sebago is a new potato variety selected from the cross Chippewa x Katahdin on the basis of its blight resistance. It is moderately resistant to late blight and highly resistant or immune to mild mosaic. It produces high yields of good quality tubers.

775. KÖHLER, E. 633.491-2.8-1.521.6:575
Beobachtungen über Virusresistenz bei Kartoffelsorten. (Observations on the resistance of potato varieties to virus).
Züchter 1938 : 10 : 321-24.

Data are given of the reaction of 26 varieties of potato to leaf roll and Y virus.

776. MILLER, J. C. 633.492:575:578.08
The breeding and improvement of sweet potatoes.
 Proc. 39th Annu. Convent. Ass. S. Agric. Wkrs, Atlanta, Ga 1938 : p. 108.
 (Abst.).

Sweet potato improvement has in the past been limited almost entirely to the selection of outstanding mutations. A method is described by which flowering and seed-setting may be induced, so making improvement by hybridization possible. The vines are trained on an upright trellis, and are cut from one half to two thirds across at the base when they have reached a length of six or seven feet. Under these conditions some varieties start flowering as early as July, while others do not bloom until the end of October. It is suggested that these differences might be due to differences in photoperiodic reaction.

777. RICHARD, J. G. 633.492:575.061.6(76.3)
 633.492 Porto Rico
Practical method of maintaining characteristics in the Porto Rico sweet potatoes.
 Proc. 39th Annu. Convent. Ass. S. Agric. Wkrs, Atlanta, Ga 1938 : p. 105.
 (Abst.).

Owing to frequent mutation in skin and flesh colour characteristics, it is difficult to keep the Porto Rico sweet potato true to the desired type. It is suggested that the flesh and skin colour of all tubers used for seed should be examined at the time of planting, and off-colour types rejected.

778. ELMER, O. H. 633.492-2.484-1.521.6:575.42(78.1)
 633.492:575.252:575.42(78.1)
Sweet potatoes in Kansas.
 Bull. Kans. Agric. Exp. Sta. 1938 : No. 278 : Pp. 52.

In this bulletin, attention is called to the widespread occurrence of bud mutation in sweet potato varieties, and to the consequent need for continued plant selection by the farmer to maintain the quality of his stocks.

Single plant selections of the variety Nancy Hall were made in 1932, in a field where the soil was heavily infested with the stem rot organism. The stock grown in this field had been selected each year since 1921, roots from desirable plants free from stem-rot infection being kept for planting. Commercially profitable crops of this strain were grown in 1932, while newly introduced stocks of Nancy Hall gave an uneconomic crop owing to severe losses from the stem rot disease.

The 1932 selections showed large differences in yield, root shape and susceptibility to stem rot.

FIBRES 633.5

779. JOTISALIKARA, L. 633.51:575(59.3)
Annual report of the Cotton Experiment Station, Klongtan, Swankaloke, Siam B.E. 2479 (1936-37). Vol. 1.
 Dep. Agric. and Fish. Bangkok, Siam 1938 : Pp. 52.

A Cotton Experiment Station was established at Klongtan, Swankaloke, Siam, in 1936. At present the work of this station is chiefly limited to relatively simple field trials, but some selection work is also being conducted. Individual plant selections were made from 200 strains of Cambodian cotton. Selections were made on the basis of the height and form of the plants, their productivity and freedom from diseases and insect pests. Seed cotton of each selection is being stored for strain trials next season.

780. HUMPHREY, L. M. and TULLER, A. V. 633.51:575:578.08
Improvements in the technique of cotton hybridization.
 Bull. Ark. Agric. Exp. Sta. 1938 : No. 359 : Pp. 11.

An improved method of cotton hybridization is described which is similar to that recommended by Doak (Cf. "Plant Breeding Abstracts", Vol. V, Abst. 409), but differs in two essential

respects: (1) the section of lemonade straw used to cover the stigma is fastened to the plant by means of copper wire instead of by clipping or tying it to the bracts and (2) the stamens of the male parent are put into the straw, so that when they open pollination will be accomplished and the flower will not have to be visited again.

781. HAWKINS, R. S. 633.51:575-181.12:677.1:581.6
Relation between fiber length and maturity in cotton.
 J. Agric. Res. 1938 : 57 : 583-87.

It is concluded that the longest and shortest fibres in a sample of cotton are less mature than those of intermediate lengths. In selecting progenies for more uniform fibre length, the plant breeder is therefore also selecting towards improved fibre maturity.

782. CHEVALIER, A. 633.51:576.16(6)
 Les espèces, variétés et hybrides de cotonniers, spécialement les cotonniers d'origine asiatique cultivés en Afrique tropicale. (**The species, varieties and hybrids of cottons especially those of Asiatic origin cultivated in tropical Africa**).
 C.R. Acad. Sci. Paris 1939 : 208 : 22-25.

CHEVALIER, A.
 Les espèces, variétés et hybrides de cotonniers d'Amérique actuellement cultivés en Afrique tropicale et leur amélioration. (**The species, varieties and hybrids of American cottons now cultivated in tropical Africa and their improvement**).
 C.R. Acad. Sci. Paris 1939 : 208 : 241-45.

A brief account of the cottons from Asia and America now grown in Africa, some of them from very ancient times.

783. NEAL, D. C. 633.51-2.484-1.521.6
 633.51.00.14(76.2)
A study of wilt resistance of cotton in South Mississippi.
 Circ. Miss. Agric. Exp. Sta. 1938 : No. 99 : Pp. 7.

Studies were made of the resistance to *Fusarium* wilt and the yielding ability of a large number of cotton varieties selected from localities throughout the Cotton Belt. A South Carolina strain of Dixie Triumph was one of the most wilt-resistant varieties, and in addition was of satisfactory quality and productivity. Some varieties which showed a high degree of infection appeared to be tolerant to the disease, and yielded better than most varieties showing higher resistance.

Pima Egyptian and Sea Island cottons were immune to *Fusarium* wilt.

784. NEAL, D. C. and HADDON, C. B. 633.51-2.484-1.521.6:575(76.3)
A promising wilt-resistant long-staple cotton.
 Proc. 39th Annu. Convent. Ass. S. Agric. Wkrs, Atlanta, Ga 1938 : p. 144. (Abst.).

A selection of Delfos cotton (Delfos 2323 965-425) made at the Northeast Louisiana Experiment Station has proved to be markedly resistant to *Fusarium* wilt. In a comparative test with six standard varieties at St Joseph, La., the selection ranked second. Its lint percentage is about 32.5, and its staple length 1 1/8 ins on bluff soil and 1 5/32 to 1 3/16 ins in the Mississippi Delta.

785. BARRE, H. W. 633.51:677.1:575
Some production and biological aspects of cotton quality.
 Text. Research 1938 : 8 : 317-22.

Some of the results of the "Regional Variety Study which involves the planting of 16 varieties or types of cotton from the same seed stock at 14 different places across the cotton belt and

seven varieties at four locations in the irrigated sections of the southwest for three years in succession in order to study the influence of variety, soil, climate and season on fibre properties and spinning value" are briefly considered. From the data available, the variety appears to be the most important single factor determining quality and is definitely the most important factor for staple length.

Fineness of fibre as determined by weight per unit length is as definitely inherited as staple length. Local conditions may, however, affect fineness to some extent. Fibre strength and yarn strength appear to be mainly determined by the variety. These results are discussed in connexion with the needs of the cotton industry.

Some results of a study of the physiology of the fibre are mentioned.

786. 633.51:677.1:575(78-9)
STROMAN, G. N. 633.51 Acala

Improved strains of Acala cotton for New Mexico.

Bull. N. Mex. Agric. Exp. Sta. 1938 : No. 256 : Pp. 46.

Strains of Acala cotton are being selected for earliness and greater uniformity of fibre length (as measured by the percentage of fibres $1\frac{1}{8}$ inch long or longer), coupled with yielding ability at least equal to the strains at present grown. Very considerable improvement has already been effected, and two strains, 1064 and 1517, will be available for general distribution to farmers in 1939 and 1940 respectively. The former strain is to be known as Acala 37A. At Roswell, N.M., it has outyielded the standard variety, College Acala, is earlier, and has a higher percentage of fibres longer than $1\frac{1}{8}$ inches.

787. 633.52:576.354.4:576.312.35
INOUE, T.
Meiosis in *Linum*.

Bull. Miyazaki Coll. Agric. For. 1938 : No. 10 : 89-106.

Meiosis in *Linum perenne* and *L. usitatissimum* is described. The haploid chromosome numbers are nine and fifteen respectively, and the course of meiosis is apparently normal.

788. 633.522:575.061.634
JANNACCONE, A.
Su alcune piante albicate di canapa (*Cannabis sativa* L.) comparse nel
Napoleitano. Nota I. [On some albino plants of hemp (*C. sativa* L.)
which appeared in the Naples district. Note I].
Ann. Tec. Agr., Roma 1938 : 11 : 163-66.

A description of some plants of hemp in which the stems of the male plants were creamy white from the base to the apex and in the female plants light green towards the apex; the adult leaves were completely white and the plants matured early. The albinism appeared at a definite stage in development beginning in the adult organs and passing on to the younger parts.

Further investigations are being made.

789. 633.522:576.356.5:581.04:577.88
WARMKE, H. E. and 635.41:576.356.5:581.04:577.88
BLAKESLEE, A. F.
Effect of polyploidy upon the sex mechanism in dioecious plants.
Genetics 1939 : 24 : 88-89. (Abst.).

The use of colchicine to produce chromosome doubling in dioecious plants provides a new approach to the study of sex inheritance. Polyploid races of three such species are now available for study, *Cannabis sativa*, *Spinacia oleracea* and *Lychnis dioica*. Chromosome doubling has not produced hermaphrodites in these species, as it is supposed to have done in *Empetrum hermaphroditum*. Of 32 second generation tetraploid plants of *Cannabis sativa*, 4 were male and 28 female, with no intersexes. Chromosomes were counted at meiosis in males and in root tips in females. At meiotic metaphase, association was predominantly in bivalents, only 0-3 quadrivalents being found. It is tentatively suggested that the abnormal sex ratio may be due to the functioning of XXXX and XXXY plants as female, and of XXY

individuals as male, the sex chromosomes in the male plants usually forming two bivalents, XX and YY, in meiosis. A single intersex was triploid, presumably XXY. In *Spinacia oleracea*, three tetraploid and three triploid plants had flowered at the time of writing. Two male plants and one intersex were found in each case, apparently giving a different sex ratio from that in hemp. No detailed results are yet available for *Lychnis dioica*.

790. BRESLAVETS, L. 633.522:577.8:537.531
(Morphological changes in hemp caused by X-rays. II. Microscopic investigations).

Symposium dedicated to the memory of V. N. Lubimenko. Acad. Sci. Ukr. S.S.R. Inst. Bot., Kiev 1938 : 361-69.

An account of the microscopic findings in hemp in which sex reversal phenomena initiated by short day conditions have been intensified by X-ray irradiation.

791. GRIŠKO, N. N. 633.522:581.162:575
(Simultaneously maturing hemp). 633.522:575"793"(47)

Len i Konoplja (Flax and Hemp) 1938 : No. 11 : 31-32.

It is claimed that as a result of the production in the U.S.S.R. of hemp varieties in which the male and female inflorescence mature simultaneously, cultivation has been widely extended, yields greatly increased and fibre quality raised. Research is now concentrated on breeding early maturing types from crossings of very early northern forms with Russian varieties ripening at the same time.

792. KHRAMČENKO, G. I. 633.522:581.162:575
(Constancy of simultaneously maturing hemp).
Len i Konoplja (Flax and Hemp) 1938 : No. 5 : 59-60.

An experiment made to test the assertion that in the hemp bred by N. N. Griško the male and female inflorescences did not always mature simultaneously showed that any such deficiency reported was due to varietal impurity of the seed and should be remedied by careful breeding and seed production.

793. SATÔ, D. 633.526.2:576.312.35:576.312.34
Karyotype alteration and phylogeny. IV. Karyotypes in Amaryllidaceae with special reference to the SAT-chromosome.
Cytologia, Tokyo 1938 : 9 : 203-42.

An analysis of the karyotypes of various species and genera of the Amaryllidaceae.

The subfamily Agavoideae resembles the subfamily Yuccae (Liliaceae) in its karyotype, and is distinct from the other subfamilies of the Amaryllidaceae. The genera *Bravoa*, *Polianthes*, *Agave*, *Fourcroya* and *Beschorneria* are all of similar karyotype, the basic chromosome set being 5 long and 25 short chromosomes. Polyploidy is frequent, the actual chromosome numbers reported being as follows: *Bravoa gemniflora*, *Polianthes tuberosa flore-pleno*, *Agave vivipara*, *A. lutea* var. *heterocentra*, *A. univittata*, *A. Verschaffelti*, *Fourcroya gigantea*, *F. pubescens*, *Beschorneria tubiflora*, $2n = 60$; *A. Zapuze* $2n = 90$; *A. americana*, *A. americana* var. *albo-marginata*, *A. americana* var. *albo-variegata*, $2n = 120$; *A. sisalana* $2n = 150$; *A. atrovirens* $2n = 180$.

The genus *Doryanthes*, also in the Agavoideae, has a different karyotype, consisting of two long and 22 short chromosomes. The chromosome number $2n = 48$ was found in *D. Palmeri*, *D. Guilfoylei* and *D. excelsa*.

Various methods by which alterations in the karyotype can arise and the relationship between satellited chromosomes and nucleoli are discussed.

SUGAR PLANTS 633.6

794. RANDES, R. D. and 633.61-2.411.4-1.521.6:575(73)
DOPP, E. 633.61:575.127.2

***Pythium* root rot of sugar cane.**

Tech. Bull. U.S. Dep. Agric. 1938 : No. 666 : Pp. 96.

The root rot disease of sugar cane caused principally by *Pythium arrhenomanes*, which causes serious annual losses in the United States, is described in detail.

The present commercial varieties grown in Louisiana which show resistance to root rot are all undesirable in some other respect. The breeding of new resistant varieties is therefore very important.

Tests on various species of *Saccharum* show that most noble varieties (*S. officinarum*) are highly susceptible to root rot.

S. sinense and *S. spontaneum* are both highly resistant, while two varieties of *S. barberi* occupy an intermediate position. F₁ hybrids between susceptible noble and resistant wild canes were in general resistant, but repeated back-crossing to the noble parent to improve the economic desirability of the progeny resulted in increasing susceptibility in the cases under observation. Owing to the highly heterozygous genotype of most commercial canes, an important feature of the breeding programme is to determine which parental combinations give a reasonably high proportion of vigorous resistant canes.

Data are given as to the root rot resistance of the major commercial sugar cane varieties now grown in the States, and of certain new selections of the 1929 to 1933 series.

It is pointed out that the problem of breeding for root rot resistance is to some degree complicated by physiological specialization of the fungus.

795. ABBOTT, E. V. 633.61-2.483-1.521.6:575(73)
Red rot of sugar cane.

Tech. Bull. U.S. Dep. Agric. 1938 : No. 641 : Pp. 96.

The red rot disease of sugar cane and the causal fungus, *Colletotrichum falcatum* Went are described in detail.

The methods used in determining the degree of resistance of sugar cane seedlings to red rot at the sugar cane breeding station at Canal Point, Florida, are described. Tests are conducted both in the laboratory and in the field.

Up to the present, no marked varietal specialization of the different physiological races of the fungus has been evident, and it is concluded that testing with only one isolate generally gives a satisfactory measure of resistance. A race of *C. falcatum* to which the generally resistant variety Co. 281 is susceptible has, however, been discovered.

Varieties of *Saccharum officinarum* are generally very susceptible to the disease. Only two varieties of *S. barberi* were tested, of which one was very susceptible and the other moderately resistant. *S. sinense* was only slightly less susceptible than *S. officinarum*, and the one variety of *S. robustum* tested was also susceptible. *S. spontaneum*, however, is considerably more resistant than the other species, 13 of the 14 varieties tested being moderately resistant. A study of the genealogy of resistant hybrid cane varieties produced at Canal Point, indicates that *S. spontaneum* is the probable source of resistance to the disease.

The distribution of red rot resistance in four seedling progenies is described. No correlation was found between resistance and growth habit, agronomic character of the seedlings or the sucrose content of their juices. It is concluded from the results that the variety Co.281 is of considerable value as a parent for imparting resistance to red rot.

The red rot reaction of 79 of the most promising sugar cane varieties bred at the Canal Point station from 1929 to 1934 is described.

Preliminary studies of the mechanism of resistance indicate the possibility that this may be correlated with high phenol content of the extracted plant juice.

796.

Original sugar beet seeds U.S.S.R.

Glavsakhar Exportkhléb. Moscow : Pp. 40.

633.63:575(47)

In this pamphlet, which describes several strains of Russian sugar beet seed available for export purposes, the scope and methods of sugar beet breeding in the U.S.S.R. are briefly outlined.

797.

ORLOVSKI, N. I.

633.63:575(47)

(Results of breeding sugar beets in U.S.S.R.).

633.63-1.557:575

Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1938 :
Nos 1-2 : 29-46.

In place of the three stations devoted to sugar beet breeding before the Revolution there are now nine. Experience gained in the early years has shown that most varieties are restricted as regards the areas to which they are suited and all breeding work is now carried out with special areas and sets of conditions in mind. More and more varieties combining high yield and high sugar content are being produced, toward the achievement of which the method of repeated back-crossing with the high yielding parent has contributed a great deal; also the method of diallel crossing to determine the best parental strains. Marked differences have been observed in the results from different parental combinations and the best forms are preserved vegetatively. Improved yields have been attained also by mixing strains of known responsivity to a number of different manurial elements and other factors. By methods of this kind yields of 1049 centners per ha. with a sugar content of 19 per cent have been obtained. Vernalization has raised both yield and sugar content in nearly all varieties and has also reduced noxious nitrogen; it has been used in selecting types free from bolting, which has also brought about a further yield increase; two generations a year are now obtained by the aid of vernalization and supplementary illumination. The extent of vernalization in seeds can be tested by the rate at which they turn Phenol Red yellow.

Disease resistance has been increased by breeding methods, and also winter-hardiness, drought resistance and earliness, whilst noxious nitrogen has been reduced. Vigour of young seedlings has been found to be a fairly reliable index of later yield.

Data are given on the performance of the new lines in comparison with the best strains from abroad; the Soviet lines proved distinctly superior in yield of sugar per unit area and there has been a progressive increase from year to year even in these varieties.

Other lines of breeding that have proved promising are interspecific crossing and crossing of sugar beet with the other forms of cultivated beet; inbreeding is still applied to a certain extent and for special purposes, though no commercial strains have been obtained by its means.

798.

SAVITSKI, V. F. and

OKANENKO, A. S.

633.63:575.127

(The sugar content and biochemical properties studied in hybrids of sugar, fodder, table beet and of chard).

Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1938 :
Nos 1-2 : 153-72.

Hybrids of sugar beet and other types of beet are generally intermediate in sugar content, though the exact value is influenced by environmental conditions. Thus the F_1 hybrids of a sugar beet with 15 per cent and a forage beet with 4-6 per cent sugar vary from 9.5 to 12.5 per cent sugar; under better conditions the sugar beet may contain up to 21 per cent, the forage beet 10-12 and the hybrid 15-18 per cent. Similar results were obtained in crossing with table beets, whilst in crosses with the chard the hybrids were distinctly closer to the sugar beet than to the chard parent. In crosses between different forms of forage beet and between table and forage forms, the F_1 is often higher than either parent.

As regards yield the best hybrids are those in which the forage beet participates, and both dominance of high yield and heterosis were more frequent than in respect of sugar content. Response to amelioration of growth conditions was greater in the forage than the sugar beet and in this respect again the hybrids were intermediate. In crosses between different races

of sugar beet, heterosis as regards sugar content was also sometimes observed; similarly on crossing different races of the other types.

Sugar contents in excess of the higher parent were observed in a number of crosses of white chard with forage or table beets and the excess was in these cases preserved in the later generations.

The distribution of the sugars in different tissues was studied in the sugar beet Uladovka and Yellow Eckendorf and their hybrid; Eckendorf is characterized by a more rapid inversion of sucrose, and by a greater proportion of soluble sugars in the crown than in the root, the root sugar being present mainly in the vascular bundles; in the sugar beet the sugar is mainly in the parenchyma. The F_1 hybrid had the sugars mainly in the bundles, though their quantity was less than the mean between the two parents. In the amount of monosaccharides the hybrid was almost equal to Eckendorf in the crown, intermediate between the two parents in the parenchyma and below in the bundles. Reserve carbohydrates were intermediate between the two parents, there being more in the bundles than in the parenchyma.

Intensive manuring caused a fall in sugar content in the sugar beet and still more in Eckendorf; the hybrid under these conditions was above the mean of the parents, especially in the bundles, and the proportion of monosaccharides was distinctly reduced in all tissues except the parenchyma. The reserve carbohydrates were greatly reduced in Eckendorf but unchanged in the sugar beet and the hybrid.

When the sugars were calculated as a proportion of the dry matter the sugar content of the parenchyma of the hybrid (and sugar beet) appears relatively higher, that of the bundles intermediate between the parents and the reserve carbohydrates are intermediate or approach the sugar beet.

The catalase activity in Eckendorf is lower than in sugar beet and in the hybrid also low, especially when calculated on a dry weight basis. Invertase activity of the hybrid was of the sugar beet type and much greater than in Eckendorf.

Protein nitrogen was reduced by intensive manuring in the sugar beet and increased in the hybrid, being unchanged in Eckendorf. Soluble protein was intermediate between the parents. From the above it is seen that the F_1 hybrid in some respects resembles one parent, in others the other, and in some is different from both. Great possibilities for improvement are envisaged by a suitable choice of parents.

The hybrid green chard x Dewing table beet exceeded both parents in root weight, sugar percentage and number of vascular rings. The monosaccharide content was similar to the parents but the sucrose and reserve carbohydrates content much higher. The dry matter content was also higher. The sugars were more in the parenchyma than in the bundles. The invertase activity was less than in either parent, the catalase activity distinctly higher; for all forms of nitrogen the hybrid was intermediate in the root, higher in the crown. From these results it is clear that the chard has a very favourable effect in crossing and its use in breeding is recommended.

799. SAIKOVSKAYA, N. 633.63:576.312.34:576.16
 (A comparative study of the morphology of chromosomes in cultivated forms of the species *Beta vulgaris* L.).
 Symposium dedicated to the memory of V. N. Lubimenko. Acad. Sci. Ukr. S.S.R. Inst. Bot., Kiev 1938: 371-86.

The material used for this study comprised 7 varieties of sugar beet (*Beta vulgaris* var. *saccharifera*), including one inbred line with one-seeded seed balls, also 4 types of *B. vulgaris* var. *crassa*, and 2 forms of *B. vulgaris* var. *cicla*. The methods adopted had already been used (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 246). In all the 39 plates examined the same 8 different types of chromosomes were found as had been previously recorded in investigating the wild species of beet (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 997) and in sugar beet material at the Uladovskaja Station.

On the basis of chromosome length, certain groupings could be established among the various forms of beet examined.

The 7 varieties of sugar beet exhibited 3 such groups; here it is interesting to note that though

Verkhnjačskaja (obtained from the Verkhnjač Station) fell in the first group, the inbred lines derived from Verkhnjačskaja fell in the third group.

Tabulated data are cited showing that the fodder beet differs in chromosome length from the culinary beet, the Swiss chard and the sugar beet and that the latter three botanical varieties do not differ in regard to chromosome lengths.

Data have also been assembled on the average ratio of the length of the arms of the chromosomes; the author concluded that most of the various forms of *Beta* examined differed but little in this respect: with the exception of (1) Uladovka, which had chromosomes with the most unequal arms, and (2) the Swiss chard in which chromosomes with arms of almost equal length were found.

No correlation was found between chromosome size and cell size in the plates examined, cell size being (according to the author) mainly determined by the localization of the cell in the root tip. No difference was noted between beet varieties as regards size of the meristematic cells, but evidence in favour of a direct correlation between cell and chromosome size in the adult plant was found. It is quite probable, in the author's opinion, that plants with larger structural parts, e.g. cells, vessels, etc., possess larger chromosomes.

800. KOVALEVSKAYA, M. F. 633.63:576.356.5:581.03
(Contribution to experimental production of polyploids in beet).
 Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1938 :
 Nos. 1-2 : 181-91.

By decapitation followed by the removal of the axillary shoots, callus formation was induced and a number of adventitious shoots were formed. These were rooted and a relatively large proportion of them proved to be tetraploid, in one year as many as 50 per cent.

The wound surface was treated with various agencies, including X-rays and various chemicals; the X-ray treatment gave the largest proportion of tetraploids, apparently owing to its stimulating effect on cell division. The results varied with the variety used, Uladovka giving distinctly better regeneration than the self-fertile strains of the Ivanov Station.

The majority of the tetraploid shoots were chimaeras and some had diploid, tetraploid and also octoploid tissue. The progeny of most of them were diploid, but nearly always higher in root weight than the normal parental strain. Some chimaeras appeared also amongst the progeny. The vegetative progeny were also diploid.

801. ARKHIMOVITSH, A. 633.63:578.08:575
(A new type of isolator for groups of sugar beet plantings).
 J. Inst. Bot. Acad. Sci. Ukraine 1938 : Nos. 18-19 (26-27) : 257-70.

Previous types of isolators used to effect inter-pollination of a group of sugar beet plants were unsatisfactory. Little or no seed was obtained, and this was shown to be due to the very high temperature and low relative humidity of the air in the isolator in the middle of the day.

The author has worked out methods of lowering the temperature and increasing the humidity within the isolator, and also of setting the air in motion so that pollen may be carried freely from plant to plant.

The innovations devised consist essentially (1) in the introduction of electric fans within the isolator and (2) a system of water-cooling whereby the glass roof (covered with gauze) and the southern side, which is composed of gauze instead of glass, are kept cool.

With these modifications, seed yields as high as those of free flowering plants were obtained.

802. SEMPOLOVSKI, L. L. 633.63-2.4-1.521.6:575(47)
(Breeding sugar beet at the Uladovo-Lulinetzky Beet-Breeding Station for immunity against fungus diseases).
 Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1938 :
 Nos. 1-2 : 47-53.

Great attention is paid to healthy seed and to weight of seed, as heavy seeds are found to give rise to vigorous, and thus healthier, plants. Only healthy plants too are taken as élites.

Selection is carried out on the basis of root weight, percentage sugar, dry matter, noxious nitrogen, salts, invert sugar, etc., the best time for estimation being found to be the winter, when keeping capacity can also be judged. In the future emphasis is to be placed on breeding for disease resistance and the first steps in this direction are already being taken.

803. ANDERSON, E. and HUBRICHT, L. 633.64:576.1:582(73)
The American Sugar Maples. I. Phylogenetic relationships, as deduced from a study of leaf variation.
 Bot. Gaz. 1938 : 100 : 312-23.

It was concluded that *Acer saccharum* s. str. and *A. saccharum* var. *rugelii* are the older elements of the sugar maple population of the North-eastern United States, *A. saccharum* var. *nigrum* representing some sort of interaction product between the two.

804. OPSOMER, J.-E. 633.682:575.42(67.5)
 Technique et premiers résultats de l'amélioration du manioc à Yangambi (Congo Belge). [**Technique and preliminary results of the improvement of manihot at Yangambi (Belgian Congo)**].
 Agric. Elev. Congo Belge 1939 : 13 : 4-7.

Details are given of the methods and results obtained by the selection of the existing varieties by means of cuttings and seedlings.

The varieties grown from cuttings are studied for their behaviour to mosaic, their vigour and their yield and toxicity. A systematic study of the varieties is to be made. Strains with a high yield and good resistance to mosaic have been selected.

Selection of seedlings is less advanced and with regard to resistance to mosaic it appears that only a very few plants are resistant and that as yield and other characters have also to be taken into consideration, selection of plants only slightly attacked is recommended.

STIMULANTS 633.7

805. BENINCASA, M. 633.71:575(45)
 Il "Burley di gran reddito." ("Burley di gran reddito" tobacco).
 Boll. Tec. Tab. 1938 : 35 : 127-30.

A description of the origin and performance of a new strain of Burley tobacco produced by the hybridization of four different varieties. The new form, if grown on very fertile soil, is very high-yielding and resistant to *Thielavia*.

806. *COOLHAAS, C. 633.71:575(92.2)
 Proefstation voor Vorstenlandsche Tabak. Jaarverslag Oogstjaar 1935-1936.
 (Experiment Station for Vorstenland Tobacco. Annual report—Harvest year 1935-1936).

Meded. Proefst. Vorstenl. Tab. Klaten (Java) 1937 : No. 84 : Pp. 88.

Selection was continued with the (Deli x Kanari) x Kanari (D12K) tobacco cross. Though one plot showed high quality, the middle leaf was still always unusable; selection is to be continued and back-crossing again to Kanari practised, the object being to retain the fine veining of these hybrids, while eliminating the high susceptibility to drought injury.

Among the Kanari crosses the strain KK 63 has appeared so promising in variety tests that the F_8 generation is to be released to planters.

The selection from KW 12 x KS 63 gave very good results and was rated highly in Holland. This strain will in future be known as KK 11.

E_3K 66 sibs are being further selected (F_8) and are giving some very good plants, though this line will probably be surpassed by E_3K 18-19 (sib E_3K 57) which (at the F_9) has reached the stage when it can be transferred to the estates. Good results were also obtained with E_3K 57 and E_3K 66 at Djombor.

Selection in the Timor Vorstenland back crosses (TV) for resistance to *Phytophthora* has resulted in increased resistance and in general the TV lines can be recommended to growers

* An extended summary of this paper is on file at the Bureau.

for all localities where *Phytophthora* may be encountered and highly resistant plants are needed.

At Methook the F_4 progeny from the E x KBS cross were no advance on the F_3 ; but at Djombor the best plants from the F_4 are undergoing further selection with special reference to good burning properties.

At Methook and Djombor the F_2 of crosses of some Y_{10} and Kanari strains were sown and at Methook trials were continued with seed from some very good plants from the F_2 from Y_{10} LOD x Kan. 56 and from Y_{10} 788 x KW 10; while at Djombor the progeny of Y_{10} 788 x KBS and Y_{10} 788 x KW 10 were also carried on.

In the 1935-36 planting reciprocal crosses were made between mosaic resistant Ambalema and Kanari; and also crosses between Y_{10} strains *inter se*, between Kanari and Kedoe, and between Kanari and Wonosobo. The last named combination was made with the object of selecting from the progeny of these crosses (or back-crosses to Kanari) plants with high quality and with plenty of aroma. The first generations of these reciprocal crosses were sown in 1936.

Among the original mutants, Brachifolia, a dark grained type has often done well in variety tests but has been frequently criticized in tests in Holland; Rotundifolia, however, has not shown itself superior in quality to existing types at the station.

The amount of mutant plant material is extensive and letters are being used as designations instead of names. The promising mutants are designated KR (instead of KX as previously stated). KR 4, KR 5, KR 6, KR 7 and KR 8 are probably of practical importance. KR 4 no longer shows Kanari types in its progeny and is characterized by a fine leaf structure, bright colour and well shaped leaves. KR 5 is a self sterile mutant which on being crossed with Kanari gave a tobacco which has fine and well-shaped leaves and has been approved in tests. KR 6 is a pale leaved form with round short leaves; KR 7 is also round leaved and KR 8 is a mutant with profuse foliage. The qualitative characteristics of these X-ray mutants are to be investigated.

An analysis of comparative variety trials (1934-35) of the strain KW 10 with Chlorina x KW 10, of KBS with Chlorina x KBS and of Chlorina x KW 10 with Chlorina x KBS showed that, as in 1933-34, the Chlorina crosses were of high quality, taking first place in many cases. Comparison of the crosses Chlorina x KW 10 and Chlorina x KBS on estates turned out in favour of the former.

Plot tests of two selections from the Timor-Vorstenland back-crosses showed that these two lines were less susceptible to *Oidium tabaci* as well as being *Phytophthora* resistant.

Variety tests of the artificially induced mutants KR 2 (Brachifolia) and KR 4 were conducted. The former has very good features, such as round leaves and good graining; KR 4 has made a very favourable impression for its leaf characters, but has the disadvantage of being comparatively slow in growth, which occasions difficulty in variety tests; also it is not yet known whether the mutant breeds true for the growth rate characteristic. It certainly appears a promising type for increasing the percentage of wrapper leaf.

Among the phytopathological researches carried out during the year were tests of the *Phytophthora* resistance of Timor hybrids and Kanari plants raised in water cultures and infected through the roots with mycelium. The Kanari roots rapidly died off but the Timor roots remained fresh for a long time and continued to grow, though they too ultimately succumbed to the effects of the fungus. The reason why the mycelium did not readily grow in the Timor roots requires investigation.

Research is also in progress on the production of tobacco varieties resistant to most of the prevalent types of mosaic.

807. YABLOKOVA, V. A.

633.71:575.125

(Materials for the anatomical investigation of heterosis in *Nicotiana*).

J. Bot. U.R.S.S. 1938 : 23 : 209-16.

The hybrid Dubec x Havana showed marked heterosis; it was intermediate in diameter of the vascular bundles but the area of the leaf trace was larger than that of the larger parent, on account of the larger size of the mesophyll cells of the leaf. The size of the seeds giving

rise to plants showing heterosis was greater than in the greater parent and measurements of the embryo and endosperm showed an increase in both these organs in comparison with the parents. The ratio of the size of endosperm to embryo was also greater in certain hybrids, though not in the reciprocals. These differences were not observed in hybrids without heterosis.

Similar results were obtained in crosses between different varieties of *N. rustica*, except that the ratio of endosperm to embryo was reduced in the hybrids showing heterosis.

808.

AVERY, P.

633.71:575.127.2

633.71:576.312.34:576.1

Cytogenetic evidences of *Nicotiana* phylesis in the Alata-group.

Univ. Calif. Publ. Bot. 1938 : 18 : 153-94.

Descriptions are given of the karyotypes of the 9- and 10-chromosome species *Nicotiana alata*, *N. bonariensis*, *N. Langsdorffii*, *N. longiflora* and *N. plumbaginifolia* and of chromosome pairing in their F_1 hybrids.

The probable relationship between these species is discussed: it is concluded that they are closely related and form a distinct natural group, the Alata group, within the genus.

809.

GREENLEAF, W. H.

633.71:575.127.2:576.356.5:577.17

Induction of polyploidy in *Nicotiana* by hetero-auxin treatment.

J. Hered. 1938 : 29 : 451-64.

The cut surface of decapitated stems of the F_1 hybrids *Nicotiana sylvestris* x *N. tomentosa* and *N. sylvestris* x *N. tomentosiformis* was covered with a thin layer of lanolin paste containing 1 per cent of indole-3-acetic acid. Copious production of callus was induced, this callus bearing large numbers of adventitious shoots which were removed and rooted (Cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 905). Of 1,973 such shoots which were classified, 13.7 per cent were tetraploid. There were also 30 octoploid and five different heteroploid shoots.

The tetraploids differed from the diploids in having broader leaves in proportion to their length, larger flowers, larger stomata and glandular hairs and coarser venation, inclined to be slightly fasciated. The leaf surface was slightly buckled between the veins. Whereas the diploid F_1 plants showed mostly unpaired chromosomes at meiosis and 99.5 per cent or more bad pollen, the tetraploid *N. sylvestris* x *N. tomentosiformis* showed 22 to 24 bivalents and had 85 per cent good pollen. The *N. sylvestris* x *N. tomentosa* hybrid behaved similarly. The octoploid plants were considerably deformed, having numerous small, thick, fleshy, contorted leaves with fasciated venation and thick, fleshy stems. Their cells, including stomatal guard cells and hairs, were much larger than in the tetraploid.

810.

WARMKE, H. E. and

BLAKESLEE, A. F.

633.71:575.127.2:576.356.5:581.04

Induction of tetraploidy in *Nicotiana sanderae* and in the sterile hybrid *N. tabacum* x *N. glutinosa* by colchicine treatment.

Genetics 1939 : 24 : 109-10. (Abst.).

Of 35 plants of *Nicotiana Sanderae* raised from seed treated with colchicine, 18 (51 per cent) were found to be wholly or partially tetraploid, pollen grain size being the criterion used. The tetraploid plants have greatly enlarged corolla tubes, and their seeds are distinctly bigger than the seeds of diploids.

N. Tabacum x *N. glutinosa* hybrids, which were sterile and had an average of 98 per cent bad pollen, were sprayed with 1 per cent colchicine in lanolin emulsion. Of 39 plants, five (13 per cent) subsequently produced branches with 10 to 90 per cent of good pollen, and three, at the time of writing, had set capsules following hand pollination. The chromosome number had thus been doubled by the treatment.

811. MODILEWSKI, J. 633.71:576.356.5:576.3:581.3
 (Cytogenetic investigation of the genus *Nicotiana*. VI. Cytology
 and embryology of the amphidiploid *Nicotiana disulovii*).
 J. Inst. Bot. Acad. Sci. Ukraine 1938 : No. 17 (25) : 97-112.

A comparative study of the cytology and embryology of the amphidiploid *Nicotiana disulovii* and its two parents, *N. Bigalovii* and *N. Suaveolens*.

Meiosis in the amphidiploid is generally regular. Forty bivalents were observed in the embryo-sac mother cell, and no multivalents occurred.

Occasional lagging chromosomes were found at anaphase I in the pollen cells, but the pollen was functionally normal. The only unusual features noted were (1) an abnormally prolonged prophase of the first mitosis in the embryo sac, (2) slower pollen tube growth than the parents and (3) the presence of an abnormal third nucleolus in the egg cell nucleus after its fertilization.

812. SMITH, H. H. 633.71:576.356.5:581.04
 633.71:575.127.2:576.356.5
 Induction of polyploidy in *Nicotiana* species and species hybrids
 by treatment with colchicine.
 Genetics 1939 : 24 : 85-86. (Abst.).

Chromosome doubling was induced by colchicine treatment in *Nicotiana glauca*, *N. Tabacum*, *N. rustica*, F_1 (*Tabacum* x *glauca*), F_1 (*Tabacum* x *sylvestris*), F_1 (*glutinosa* x *glauca*) and in four segregates from crosses between *N. rustica* and *N. Tabacum*. The hybrids were rendered fertile by the treatment. The induced autotetraploids of *N. rustica* and *N. Tabacum* were more sterile and smaller and their leaves were smaller and thicker as compared with corresponding diploids. Two generations of polyploid plants have been grown from the original treated *rustica* diploids. Stomata of the polyploids of *N. rustica*, *N. Tabacum*, *N. glauca*, F_1 (*Tabacum* x *glauca*) and two *rustica* x *Tabacum* segregates were found to be almost twice as large as in the normal forms. The doubled number of chromosomes was counted in root tip preparations of some of the polyploids or their progeny.

813. KOSTOFF, D. and 633.71:576.356.5:581.174:575-181
 ORLOV, A. 635.64:576.356.5:581.174:575-181
 (The size of the chloroplasts in eupolyploid forms in *Nicotiana*
 and *Solanum*).
 Symposium dedicated to V. N. Lubimenko, Memb. Acad. Sci. Ukraine
 S.S.R. 1938 : 443-46, also Ann. Bot. 1938 : 2 : (N.S.) : 883-86.

Evidence is presented to show that in *Nicotiana* and in the tomato the size of the chloroplasts is not increased when a euploid increase in the chromosome number occurs; if anything, the chloroplasts decrease in size when the chromosome number is doubled.

814. GOODSPEED, T. H. 633.71:582
 Three new species of *Nicotiana* from Peru.
 Univ. Calif. Publ. Bot. 1938 : 18 : 137-52.

Descriptions and photographs are given of three new *Nicotiana* species collected in Peru, *N. Benavidesii*, *N. thyrsoiflora* and *N. Knightiana*.

815. POEL, J. van der 633.71-2.3-1.521.6:575.42(92.1)
 Kort overzicht van het slijmziekte-vraagstuk bij de Deli-tabak. (Short
 review of the slime disease problem in Deli tobacco).
 Meded. Deli-Proefst. 1939 : Ser. 3 : No. 2 : 5-16.

This paper deals mainly with external factors in the causation of slime disease but includes also a concise note on early work on selection for resistance in tobacco plants obtained from various foreign sources and including forms of *Nicotiana rustica*. For the most part, however, the Deli tobacco (grown at the Deli Experiment Station) proved more resistant than the other types tested, possibly as a consequence of selection for resistance having occurred in the course of years.

The progenies of two more than usually resistant plants discovered in 1921 and 1923 respectively are being used for further selection at the present time. The leaf quality of both the original parent plants was unfortunately poor.

816. WELLENSIEK, S. J. 633.72:575.42:578.08
Onderzoekingen over quantitatieve theeselectie IV : Moederboomselectie.
(Researches on quantitative tea-selection IV : mother tree selection).
Arch. Theecult. Ned.-Ind. 1938 : 12 : 1-70.

This paper deals with some of the conclusions reached up to the present in work on tea selection (Cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 203). Data from eight groups of plants are given to show that the frequency distribution for individual yields is always positively skew, but the skewness and coefficient of variability is less, the higher the mean yield.

The effect of various factors on the coefficient of variability has been studied. Five yield determinations were found to give sufficiently accurate results.

The methods of determining the efficiency of a plantation are discussed.

Some plants give more than three times the general mean yield and provide a basis for selection.

To attain homogeneity the use of selected material is preferable to selective thinning.

The negative correlation between mean yield and either variability or skewness suggests that the hereditarily lower yielders react more strongly than genetically high yielding trees to changes in environment—a conclusion supported by the results obtained from two groups of trees, one of which was heavily manured. Thus selection is easier to carry out in low-producing gardens.

The amount of material for actual yield tests can be reduced by a preliminary selection of mother trees by inspection. Important factors suitable for direct observation in determining yielding capacity are the rate of shoot growth soon after pruning, size of plucking surface, density of shoots on the plucking surface and the type of plant.

A fast or an average rate of shooting is probably genetically conditioned, though highly modifiable, whereas slow shooting is a chance characteristic. Rapid shooters as a group yield more than slow ones, but the rate of shooting is not the sole factor determining yield.

Density of shoots is less variable than yield and visual selection does lead to higher mean yields.

As regards the type of plant, some characters affect yield, and some quality.

Experiments on the effect of different plucking systems and of the duration of the plucking round showed that their influence is not important in mother tree selection, regarding the group of trees as a whole, but may be so in individual plants. Five or six pluckings are apparently sufficiently accurate for the estimation of yield. After this it is possible to proceed rapidly to clone testing, but if good clones are already present on the estate it is desirable to repeat the test plucking for more accurate selection.

The criteria for mother tree selection include: (1) a yield three times the general mean, and a desirable type of plant; (2) a maximum of selected plants equal to 1 per cent of all the plants tested; (3) a yield of at least 50 grams fresh leaf per plucking; (4) a position in the frequency distribution well separated from the general mass; and (5) a constant yield from plucking to plucking. Standards (2) and (3) are applied where variability is extremely high or very low, and (4) and (5) in doubtful cases.

In practice, mother tree selection can usually be carried out in any garden. Young and regular gardens with about 4,000 plants are to be preferred. Inspection by eye soon after pruning can usefully select about 5 per cent of the population.

Details are given of methods of plucking and the recording of individual yields—fresh weight is preferable. Examples of the calculations involved in the suggested scheme for selection are given. It is emphasized that the selected trees must be included in calculating the general mean.

The results of all the selection experiments on estates and experiment stations are tabulated and discussed. Individual records have been kept for 44,000 plants, i.e. 4.4 per cent of the original material, which were selected by inspection. Of the total, 0.5 per cent gave yields of three times the general mean, and 0.2 per cent (i.e. 5 per cent of the selected plants) were

chosen as mother trees. These tests have shown clearly the practicability of mother tree selection. The methods must be considered as mass selection, and in future the qualitative aspect must also be included.

L. E. M.

817. WELLENSIEK, S. J. 633.72:575.42:581.165(92.2)

De selectie der oude serie theecloonen op Tjinjireean, Pondok Gedeh en Goenoeng Paök. (**The selection of the old series of tea clones on Tjinjireean, Pondok Gedeh and Goenoeng Paök**).

Arch. Theecult. Ned.-Ind. 1938 : 12 : 197-219.

In this progress report details are given of the past and present selection work with the following clones: Tjinjireean Nos. 1-40, P.G. Nos 1-23, K.P. Nos 1-4 (K.P. = Kiara Pajoeng) and G.P. Nos 1-8. The designation "old series" is used to distinguish clones selected before 1930 from those selected after that year.

Trials for both yield and quality are still in progress and results may soon be expected. The correlation of the results of the performance of the clones under different conditions still remains to be done.

The coefficient of variation for the individual yield within clones at Tjinjireean, Pondok Gedeh and Goenoeng Paök was found to be about 30 per cent, 30 per cent and 30-50 per cent respectively.

In addition to clonal selection, twenty-six seed gardens have been laid down with combinations of the vegetatively selected clones and the results from the Soekamanah seed garden at Pondok Gedeh already appear promising from the standpoint of seedling selection.

An interesting development in technique has been the gradual amalgamation of selection by visual inspection and by actual yield determinations, the criterion now being both yielding capacity and type and recently, in addition, the estimation of the quality of the prepared product.

818. PRILLWITZ, P. M. H. H. 633.72-1.421

De berekening van het minimum aantal theeplanten in toetsingsproeven.
(**On the number of plants in testing-experiments with tea**).

Arch. Theecult. Ned.-Ind. 1934 : 8 : 1-8.

The following formula is given for the determination of the number of tea plants per treatment required to show as significant a difference of D per cent between the means of two treatments:

$$n = \left[\frac{s\%}{100} \right]^2 \times \frac{1 + \left[\frac{1 + \frac{D}{100}}{0.5} \right]^2}{\left[\frac{0.5 D}{100} \right]^2}$$

(n = number of plants required, s % = coefficient of variability, or the standard error, s, expressed as a percentage of the average yield per plant).

It is assumed that the yield of individual plants is taken, and the treatments arranged in such a way that soil heterogeneity cannot cause systematic differences between the treatments. It is estimated that 300 seedlings or 150 plants of a clone will normally be required in each treatment to distinguish as significant a difference of 10 per cent between two treatment means.

819. SCHWEIZER, J. and S'JACOB, J. C. 633.73-1.541.1
631.541.11-2.6-1.521.6

Eerste resultaten van een tweetal onderstampoeven bij Robusta-enten op Kaliwining en Djember. (**Preliminary results of two tests of stocks with Robusta grafts at Kaliwining and Djember**).

Bergcultures 1938 : 12 : 1526-32.

In investigating the influence of the stock on the growth and development of Robusta grafts, clones of Robusta, Excelsa, Arabica and Dewevrei were used as stocks and the clones BP. 25, BP. 39 and BP. 42 as scions.

The preliminary data from Kaliwining indicated that though the Dewevrei plants had been previously shown to be vigorous as regards their root system and growth and also resistant to *Tylenchus pratensis*, they did not prove suitable stocks for the scions in the experiment. It is thought to be possibly significant that BP. 4 and BP. 42 gave the best results on stocks raised from seed of BP. 4 and BP. 42 respectively, i.e. where stock and scion were closely related.

In general, similar results were obtained at Djember where the stocks used included Excelsa x Liberia hybrids, and the scions, artificial hybrids of Robusta x Arabica.

820. VERMEULEN, C. 633.79:575(49.3)
L'amélioration des houblons en Tchécoslovaquie. (**Improvement in
hops in Czechoslovakia**).
Pet. J. Brass. 1936 : 44 : p. 580.

A brief account of the improvement of hops in Czechoslovakia by means of selection and crossing.

AROMATIC PLANTS 633.8

821. MILLER, J. C. and 633.842:582
FINEMAN, Z. M. 633.842:575.1
**A study of some qualitative and quantitative characters of hot
pepper.**
Proc. 39th Annu. Convent. Ass. S. Agric. Wkrs, Atlanta, Ga 1938 : 105-06.
(Abst.).

Direct and reciprocal crosses between the groups of pepper, Tabasco, Sport, Cayenne and Bell, gave fertile hybrids and indicated that they were closely related. The author places them all in one species, *Capsicum frutescens*.

Pendent position of the fruit was found to be dominant over erect position, the character bulged fruit base was dominant over not bulged, and the unenclosed type of calyx over enclosed, a single factor being involved in each case.

OIL PLANTS 633.85

822. RICHHARIA, R. H. and
KALAMAR, W. J. 633.854:576.312.35:576.354.4
Somatic and meiotic chromosomes in *Guisotia abyssinica*, Cass.
Cytologia, Tokyo 1938 : 9 : 249-53.

The chromosome number of Niger (*Guisotia abyssinica*) is reported as $2n = 30$. The meiosis is generally regular, but occasional multivalents were observed at diakinesis. Secondary associations were observed at metaphase I and at the end of the second division. Pollen counts made on 104 plants showed 0-21 per cent bad pollen. This sterility may be due to the formation of multivalents in meiosis.

823. KLIMENKO, K. T. 633.854.56:575.127.2:575"793"
(The first fruiting of tung tree hybrids).
Soviet Subtropics 1938 : No. 10 (50) : 35-36.

From a cross of *Aleurites Fordii* x *A. cordata* and its reciprocal 183 hybrids were raised. The hybrids from both crosses differed from the parents in their vegetation period, the leaf buds opening later than *A. Fordii*, but earlier than *A. cordata*. The hybrids started flowering on the 24th May and ended in 10-15 days. Their inflorescences were composed of 8-10 exclusively female florets which in size and colour recalled the female florets of *A. Fordii*; but in structure the inflorescences resembled those of the female type of *A. cordata*. The ovaries were like those of *A. Fordii* and had 2-6 locules, but were covered as in *A. cordata* with a brown pubescence.

As the hybrids were attacked by disease, buddings from them were grafted on to trees of *A. cordata* and the observations so far collected suggest that though late flowering their fruits will ripen earlier as in *A. cordata*.

Yield and quality are still to be investigated.

RUBBER PLANTS 633.91

824. MAAS, J. G. J. A. 633.912:575.42(92.2)
De selectie van *Hevea Brasiliensis* bij 's Lands Caoutchoucbedrijf. (**The selection of *H. Brasiliensis* at 's Lands Caoutchoucbedrijf**).
Arch. Rubbercult. Ned.-Ind. 1934 : 18 : 58-82.

A full account of the paper reviewed in "Plant Breeding Abstracts", Vol. VII, Abst. 751.

825. FERWERDA, F. P. 633.912:581.165(92.2)
Verdere gegevens over AV. 255 en enkele andere AV.-clonen in de toetstuinen der Gouvernements Landbouwbedrijven. (**Further data on AV. 255 and some other AV. clones in the experimental plantations of the Government agricultural concerns**).
Bergcultures 1939 : 13 : 13-14.

Particulars are given of the performance and characteristics of AV. 255 in tests at Majang where it surpassed all the other AV. clones included in the experiment. AV. 188 also did well as regards yield and both clones should be more extensively tested under different local conditions.

826. DIJKMAN, M. J. 633.912:581.331.23:578.08
Voorloopige gegevens over het bewaren van *Hevea*-stuifmeel. (**Preliminary data on the storage of *Hevea*-pollen**).
Arch. Rubbercult. Ned.-Ind. 1938 : 22 : 239-59.

After a suitable method of determining pollen germination capacity had been evolved an investigation was made on the effects of storage upon the fertilizing capacity of *Hevea* pollen. The germination capacity could, it was found, be determined one hour after the pollen was spread upon a substrate composed of 10.53 per cent to 12.11 per cent glucose and 1.5 per cent agar agar, with a pH of 4.5 and at a temperature of 35° C. Under such conditions mature pollen from the clones AV. 157, Tjir x VI, PR. 103, 105, 106, 107 and BD. 2, 5 and 10 gave 90 per cent germination, a result which is in contrast to Ramaer's findings (Cf. "Plant Breeding Abstracts", Vol. III, Abst. 108).

These preliminary results showed that the pollen of the above clones could be stored for at least 19 days at 6° C. over solutions of H₂SO₄ ranging from 27 per cent to 35 per cent according to the optimum atmospheric humidity for the various clones.

It would appear that the pollen of all male flowers does not germinate equally well, possibly (it is tentatively suggested) owing to the stage of maturity of the flower, which in turn may depend upon the position of the flower in the inflorescence.

Incidentally a report from the Djember Experiment Station is cited as recording a set of 1.5 per cent in pollinations with pollen obtained from the clone Tjir x VI and kept on ice for two weeks.

827. MEIJER, W. H. 633.912:581.481:578.08
Eenige opmerkingen over het splijten van *Hevea* kiemplanten. (**Some observations on the splitting of *Hevea* seedlings**).
Bergcultures 1938 : 12 : 1797-1801.

Experiments have proved that in germinating *Hevea* seed intended for use in the production of twin seedlings as planting material, it is recommended that the seeds should be laid on their sides as in this position the petioles of the cotyledons are much more likely to develop symmetrically side by side and not one above the other as occurs in the majority of cases in which the seed is sown in the dorsal or ventral position. The side by side position of the cotyledonary petioles greatly facilitates the operation of dividing the seedling into two uniform portions, as the stem can grow out freely between them, the petioles are of equal length and the place where they unite on the stem and which must be cut through in dividing the seedling lies in front of the stem and not laterally.

In a series of experiments the percentages of seedlings that could be easily divided in two was invariably about 60 per cent from seeds sown in the dorsal or ventral position, and about 90 per cent from those sown lying on their sides.

A method of germinating the seed on a layer of damp river sand between the two layers of a gunny sack is described. One of its advantages is that the seed can be laid and kept in the proper position to produce uniform seedlings easy to divide in two. In addition germination proceeds rapidly and regularly and the roots are short, thus facilitating their division. (Cf. "Plant Breeding Abstracts", Vol. IX, 414).

828. VISSER, T. S. and VOLLEMA, J. S. 633.912-1.535:575.42
 Resultaten van een proef met kweekrijselectie bij *Hevea*. (**Results of an experiment with *Hevea* nursery selection**).
 Arch. Rubbercult. Ned.-Ind. 1934 : 18 : 11-20.

Rigid selection of rubber plants in the nursery in which the 100 largest and 100 smallest plants were chosen showed that contrary to expectations the planting of only the largest plants did not result in a particularly vigorous plantation. Size differences between the two groups practically disappeared after 3 years and both groups will probably come into bearing at the same time. One advantage, however, of large stumps is that they apparently take better than the smaller ones and thus lessen the chance of gaps occurring in plantations.

FRUIT TREES 634

829. RUDORF, W. 634:575(43)
 635:575(43)
 Züchterische Aufgaben im Gartenbau. (**Breeding problems in horticulture**).
 Gartenbauwirtschaft 1938 : 55 : No. 32 : p. 21.

A brief account of some of the breeding work in connexion with pome and stone fruits, berries, grapes and vegetables which is being carried out at the Kaiser-Wilhelm-Institut für Züchtungsforschung at Müncheberg.

830. SHAMEL, A. D. and POMEROY, C. S. 634:575.252:575.42
Bud selection in citrus and other tree fruits.
 Calif. Citrogr. 1937 : 23 : 24-28, 78, 83-85.

Bud selection is important as a means of maintaining the standard types of fruit tree varieties, protecting them from degeneration due to the occurrence of undesirable mutations, and also as a means of improving standard varieties by the selection of superior mutant forms. Descriptions are given of the procedure involved in the detection and testing of bud sports, with a view to interesting growers in the subject.

It appears that bud mutations are much more frequent than was once thought. Most of the mutations studied have affected one limb of a tree only, and have influenced easily observable characters of the fruit, such as time of maturity or colour. Descriptions are given of a number of commonly occurring undesirable bud sports in various fruit trees, and also of the following types which have commercial promise: the Robertson strains of the Washington Navel orange, which are resistant to "June-drop" and consequently heavy producers; they are three to four weeks earlier in ripening than the parent, and come into bearing very early after budding; the Dawn grapefruit, about a month earlier in maturity than the parent variety Marsh; an early-maturing strain of the Sims peach, which will extend the picking and canning season of that variety; the late-maturing Eldora strain of the Santa Rosa plum which has similar advantages; several red-fruited strains of the Delicious apple and an early-maturing strain of the Tilton apricot.

831. KOLESNIK, I. D. 634:575.3:581.02
(Producing varieties without hybridization).
 Plodoovoščnoe Khozaistvo (Fruit and Vegetable Growing) 1938 : No. 10 : 43-46.

Influenced by Lysenko's theory of the control of the genotype by environment, the author

subjected one-year-old cuttings from a single apple tree to different conditions of soil, temperature and light and found that the various young trees, though derived from a common genotype, showed differences in the form, size and colour of leaves and stems, and it is confidently assumed that the fruit of the young trees will also differ.

A similar instance is cited in pears.

In the application of these findings to the production of new forms by the action of environment upon cuttings or slips of the same genetic origin, it is held to be important to note for what type of plant (i.e. genotype) and at what stage in its development particular environmental conditions of light, temperature, etc. are required, if development is to be properly controlled. The capacity for adaptation to new environments is stated to be greater in the earlier stages of development than the later ones, hence the use of cuttings, slips and seed is recommended in attempts to obtain frost resistant types and extend the range of plants in a northerly direction in the U.S.S.R.

832. NEBEL, B. R. 634:576.356.5
Cytology and fruit breeding. V. The cultivated fruits.
 Fm Res. N.Y. St. Sta. 1936 : 3 : No. 1.

A brief non-technical account of the occurrence and significance of polyploidy in the most important genera of fruit trees.

833. 634-1.541(47)
 BELOKHONOV, P. V. 634:575(47)
 (The work of I. V. Michurin is extending widely among the
Sovkhozes and Kolkozoes concerned with small fruits).
 Plodoovoščnoe Khozaistvo (Fruit and Vegetable Growing) 1938 : No. 11 :
 43-47.

A survey of the work and aims of the Michurin Scientific Research Institute of Fruit Industry and the activities of Michurin's followers at various experiment centres in the U.S.S.R. Among the aims set before fruit producers are increased yields, the provision of supplies of good seedlings and the application of the staining method of determining the germination capacity of seed.

834. 634-1.541:575.257
 DANKOV, A. 633.491-1.541:635.64:575
 (N. V. Brusentsov as experimentalist and follower of Michurin).
 Plodoovoščnoe Khozaistvo (Fruit and Vegetable Growing) 1938 : No. 11 :
 57-60.

This paper deals with the developments of Michurin's work on vegetative hybridization and of Brusentsov's experiments on "graft hybrids" between the tomato and the potato which have resulted in the production of plants with fruits like the tomato and also tubers like the potato.

835. YEREMEYEV, G. 634-2.112-1.521.6:575
 (Diagnostics of the drought-hardiness in fruit plants).
 Symposium dedicated to the memory of V. N. Lubimenko. Acad. Sci. Ukr.
 S.S.R. Inst. Bot., Kiev 1938 : 245-57.

The resistance of cut leaves or shoots of *Amygdalus communis*, *Prunus persica*, *Olea europea*, *Pyrus communis*, *Pyrus malus*, and of other fruit trees was tested. The withering process in leaves and shoots was studied by making observations on the capacity of the plant material to retain water, on the condition of the stomata and the intensity of respiration.

It is concluded that the degree of resistance to withering of leaves or shoots of fruit trees under similar conditions is a stable physiological feature indicative of the drought resistance of the particular variety in question.

836.

BLAKE, M. A.

The new Lawver-McIntosh varieties of apples.

N.J. St. Hort. Soc. News 1938 : 19 : p. 1045.

A brief description of the apple varieties Maclaw, Lawmac and Mavis, which were selected by Prof. W. T. Macoun from the cross Lawver x McIntosh. The purpose of the cross was to obtain an apple of the McIntosh type, but later ripening and with better keeping quality. Unfortunately all three selections have too many of the undesirable characteristics of the Lawver parent, and it is concluded that they are not suitable for growing in New Jersey.

634.11:575(71.3)

634.11 Maclaw

634.11 Lawmac

634.11 Mavis

837.

RUDLOFF, C. F. and

WUNDRIG, G.

634.13:581.145.2:575

Zur Physiologie des Fruchtlens bei den Obstgehölzen. I. Die Aufblühfolge bei einigen Birnensorten. (On the physiology of fruiting in fruit trees.

I. The sequence of the flowering process in some varieties of pears).

Gartenbauwiss. 1939 : 12 : 530-54.

In pears the sequence of flowering is rhythmical and fairly regular. It differs in the individual varieties and is therefore genetically determined, though the genetic rhythm is probably conditioned by nutrition. On the basis of resemblances in their type of flowering three groups were found among the varieties studied.

838.

SEREISKY, A.

634.13:581.163:577.17

(The hormone factors of fruit formation and the problem of experimental parthenocarp).

Symposium dedicated to the memory of V. N. Lubimenko. Acad. Sci. Ukr. S.S.R. Inst. Bot., Kiev 1938 : 115-27.

Following experimental treatment of emasculated flowers of *Pyrus communis caucasicus* with hetero-auxin, parthenocarpic fruits were formed. The results obtained are taken as demonstrating the existence of a relation between fruit formation and hormonal substances (auxins) secreted by the pollen grains and pollen tubes and also by the fertilized ovary. The possibility of stimulating parthenocarp by administration of synthetic preparations such as hetero-auxin is considered.

The results of other workers are frequently cited, including relevant findings on xenia.

839.

HOFMANN, F. W.

634.25:575:578.08(75.5)

Importance of peach breeding for Virginia.

Virginia Fruit 1938 : 26 : No. 12 : 14-17.

A popular account of the methods employed in peach breeding at the Virginia Agricultural Experiment Station.

840.

634.25:575.061.5(75.5)

Fuzzless peach developed after many years of research. Twenty-five years of crossing and re-crossing ends with fruit of good flavour, shape and texture.

Sci. News Lett. Wash. 1937 : p. 181.

A peach with desirable general characteristics and a smooth, waxy skin has been bred by Dr. F. W. Hofman of the Virginia Agricultural Experiment Station. A tree, bearing small fuzzless fruit of poor quality was found in a seedling progeny of the variety Greensboro. This was improved by crossing with Elberta and subsequently crossing the hybrid offspring with the variety J. H. Hale.

CITRUS FRUITS 634.3

841. TORRES, J. P. 634.3:575(91.4)
634.3:581.162.5:575.127.2
Results of citrus hybridization in the Philippines.
Philipp. J. Agric. 1938 : 9 : 161-76.

A list is given of the citrus crosses attempted from 1929 to 1936, together with details of the success attained in crossing. Varieties of the same species appear to be generally cross-compatible. Many of the interspecific crosses attempted were also successful, but some of the combinations were incompatible. The degree of compatibility varied with the particular varieties used.

The technique employed for citrus hybridization is described.

842. KATARYAN, T. G. 634.3-2.111-1.521.6:578.081
(**Citrus plant frost resistance**).
Soviet Subtropics 1938 : No. 11 (51) : 47-49.

Experiments made in 1936-37 with various species of citrus fruits including pomelos, limequats, citranges and tangelos—all on *Poncirus trifoliata* stocks—showed that frost resistance could be determined in 1 or 2-year-old plant material by direct exposure to temperatures ranging between -6° C. and -13° C. in the laboratory established for research on climatic effects.

Questions of technique and the role of the degree of lignification attained by the plant in conditioning frost resistance are mentioned and the reactions of a large number of varieties of citrus are recorded. The most frost resistant forms included: lemons—Biškeviusa, Meyer's lemon and Salibaurskii; oranges—Washington Navel and No. 511; mandarines—Silverhill Satsuma and Unshiu of Yokohama; and pomelos—Natsu Mican and Foster.

843. MOROZ, E. S. 634.3-2.111-1.521.6:578.081
(**The method of determining frost-resistance of citrus**).
Soviet Subtropics 1938 : No. 10 (50) : 24-27.

A series of experiments in which species of citrus were subjected to temperatures ranging from -9° to 0-75° C. leads to the following conclusions:—

The best method of determining frost resistance in citrus species is to treat either the whole plant or some branches cut immediately before the freezing process. Both methods give approximately the same results.

The rate of lowering of the freezing temperature may range from 0-75° to 2-5° C. per hour. Sudden freezing and thawing and also prolongation of the freezing stage considerably increases the susceptibility of the plant to injury and the same holds true of repeated subjection to freezing.

Since the roots are more susceptible to frost than the aerial portions of the plant, they should be protected from the action of the low temperatures, where the whole plant is used in the test.

844. HODGSON, R. W. and 634.31:581.163
CAMERON, S. H. 634.31:581.165:575.74
Effects of reproduction by nucellar embryony on clonal characteristics in Citrus.
J. Hered. 1938 : 29 : 417-19.

A comparison was made between Paper Rind orange trees derived from (1) budwood obtained from an old clone of the variety and (2) budwood obtained from a seedling which arose from a parthenogenetic nucellar embryo. The chromosome number was the same in each case. The trees of nucellar origin were more vigorous, more upright in habit of growth and much more thorny than the trees of the old clone. Their fruit had a lower seed content. The old clone was an earlier and heavier bearer.

The authors conclude from these observations that asexual nucellar embryony leads to a rejuvenation of an old clone similar to that caused by normal sexual reproduction.

845.

634.31:581.163:581.3

634.62:575.183

A note on embryo-rejuvenation.

J. Hered. 1938 : 29 : 419-22.

An editorial note in which the course of development of supernumerary embryos derived from the nucellus in *Citrus* is traced. The rejuvenation obtainable by this means is described, and some of its implications indicated. A parallel is drawn between "neophytosis" (vegetative rejuvenation) in *Citrus* and metaxenia in the date, both phenomena indicating an interaction between the developing embryo sac and the surrounding maternal tissue.

846.

634.31:581.165:575.74

634.31:581.163:581.49

FROST, H. B.

Nucellar embryony and juvenile characters in clonal varieties of Citrus.

J. Hered. 1938 : 29 : 423-32.

Differences between old and new (nucellar seedling) clones of *Citrus* similar to those reported by Hodgson and Cameron (Abst. 844 above) are reported, and the problem of thorniness in nucellar seedlings and old clones especially discussed.

Most nucellar seedlings are very thorny, but this thorniness gradually declines with increasing age of the tree or with repeated clonal propagation by budding. The rate of this decline apparently differs for different genotypes of *Citrus*. As the thorniness and vegetative vigour of the nucellar seedling clones decrease, the trees become earlier bearers, the tendency to flower production and usually to flower setting increases, and the fruits contain more seeds. This indicates a gradual change in the clone which is akin to senescence. It is not, however, due to genetic changes, as the full vigour of the clone may be immediately restored by asexual reproduction.

Reasons are given for supposing that this clonal senescence in *Citrus* is not due to infection with virus diseases or a similar accidental cause. Various possible mechanisms by which it may be brought about are discussed.

847.

SHANIDZE, V. M.

634.334:581.163:575.252

(Seedless lemons).

Soviet Subtropics 1938 : Nos. 8-9 (48-49) : 46-47.

A brief note on a seedless mutant lemon tree which has continued to produce seedless fruits for two years in succession. The tree, which originated from a bud mutation, is relatively frost resistant, and gives a good yield of fruit of satisfactory quality. It has been used to provide scions for grafting on *Poncirus trifoliata* and on lemon trees, in order to test the hereditary nature of the seedless condition.

NUTS 634.5

848.

[WALLACE, H. A.]

634.5:575

What breeding means to improvement in plants and animals.

Rep. Proc. 28th Annu. Mtg Nth Nut Gr. Ass. Md and Wash., D.C. 1937 : 88-89.

In a short address to the Northern Nut Growers Association, the great improvement in varieties of nut-bearing trees which could be effected by the application of scientific methods of plant breeding is stressed.

849.

McKAY, J. W.

634.5:576.312.35:575

Chromosomes of some nut plants.

Rep. Proc. 28th Annu. Mtg Nth Nut Gr. Ass. Md and Wash., D.C. 1937 : 101-04.

Work is in progress at Beltsville, Maryland, to ascertain the somatic chromosome number of as many species and forms of nut-producing plants as possible. The importance of a knowledge of the chromosome number to breeders making interspecific crosses of such plants is stressed. A brief list is given of the chromosome numbers already known.

850. GRAVES, A. H. 634.53-2.421.9-1.521.6:575.127.2(73)
Breeding new chestnut trees.
 Rep. Proc. 28th Annu. Mtg Nth Nut Gr. Ass. Md and Wash., D.C. 1937 :
 93-100.

The American chestnut, *Castanea dentata*, has been practically exterminated by chestnut blight, *Endothia parasitica*. Attempts are being made to produce a tree equally good as *C. dentata* for timber purposes and for nuts and at the same time blight resistant, by crossing with certain oriental species, particularly *C. crenata* and *C. mollissima*. Many of the hybrids are extremely vigorous, having a considerably higher growth rate than either parent, and they also start to bear flowers at an earlier age. Hybrids were artificially inoculated with the disease for two years, and several of them have proved to be immune so far, though further testing is to continue. One hybrid combines apparent immunity with a very rapid growth rate.

The technique used in breeding is described in detail.

851. WOOD, M. N. and 634.551:575(79.4)
 TUFTS, W. P. 634.551 Jordanolo
 634.551 Harpareil
New almond varieties released.
 Almond Facts 1938 : 2 : No. 7 : 6-7, 11.

WOOD, M. N. and
 TUFTS, W. P.
Two new almond varieties are released.
 Pacif. Rur. Pr. 1938 : 136 : 23, 26, 53.

From the hybrid progeny of the cross Nonpareil x Harriott, grown at Davis, California, two promising almond trees were selected for further trial. Nursery trees and bud wood of these two selections were distributed to a large number of growers in various parts of California, and reports obtained as to their performance and also of their suitability to fill market requirements. They are now released under the varietal names Jordanolo and Harpareil. Jordanolo is a vigorous grower, a heavy and regular bearer, and is resistant to attacks by mites (red spiders) and more resistant to brown rot than other important Californian almond varieties, though not immune. The nuts are very easily harvested and hulled, and the shell is of an attractive light yellow colour requiring little or no bleaching. The kernel is large, easily blanched, and of outstanding quality. The main defect of the variety is that it blooms early (with the Ne Plus Ultra variety) and is therefore liable to damage by early frosts.

The Harpareil variety appears to be better than Ne Plus Ultra, but is inferior in most respects to Jordanolo, and in general is not to be recommended in preference to that variety. It was originally intended for interplanting with Jordanolo as a pollinator, but the two varieties are cross-incompatible. Both interpollinate satisfactorily with Ne Plus Ultra or I.X.L.

A list is given of the growers having stocks of Jordanolo and Harpareil trees.

SMALL BUSH FRUITS 634.7

852. DRAIN, B. D. 634.7:575:578.08(76.8)
The breeding of small fruits for the South.
 Proc. 39th Annu. Convent. Ass. S. Agric. Wkrs, Atlanta, Ga 1938 : 108-09.
 (Abst.).

A review of the technique employed in small fruit breeding at the Tennessee Agricultural Experiment Station, Tennessee. Storage of pollen, storage and germination of hybrid seed, spacing of seedlings in the nursery, recording of data on seedlings, and other related matters are dealt with. It is considered that hybridization of heterozygous material, though it has the advantage of quick results, has many failings. The chance of eliminating all undesirable genes is very small, and inbreeding followed by recombination of inbred lines would in theory be better.

Selling is reasonably successful in strawberries and raspberries, but there is a striking loss of vigour, and many seedlings or even entire lines are lost. Pure-line breeding in small fruits is thus a difficult task.

The need for the development of disease and pest resistant varieties is stressed.

853.

634.71:575(74.7)

634.72:575

634.75:575

SLATE, G. L.

New or noteworthy fruits. XII. Small fruits.

Bull. N.Y. St. Agric. Exp. Sta. 1938 : No. 680 : Pp. 18.

Fourteen new varieties of small fruits which have been tested at New York State Agricultural Experiment Station are described and evaluated.

A series of very promising raspberry seedlings has been developed from crosses between Lloyd George and other varieties. One of these, Indian Summer is the first autumn fruiting raspberry of commercial value for the state, and in addition there is some evidence that it may escape mosaic infection. Its berries, however, are soft and crumble slightly, so that it will be of use for the home garden only. It is being used extensively as a parent in further crosses.

Several other raspberry varieties are described, and also varieties of black and purple raspberries. The Sodus variety of purple raspberry may partly replace the Columbian variety, which is completely infected with mosaic disease.

Two new strawberry varieties, Dorsett and Fairfax, combine high quality with good transportability and appearance, to an extent never before attained in the region, though the latter variety has the disadvantage that it turns a dark colour when very ripe.

854.

634.711:575.127.2(75.6)

634.717:575(75.6)

Williams develops new hybrid berries. New varieties especially adapted for growth in State, says horticulturist.

Ext. Farm-News 1938 : 24 : No. 2 : p. 1.

The Dixie red raspberry variety, bred by C. F. Williams in North Carolina, was produced by crossing Asiatic species with the variety Latham. It is suitable for cultivation in the sandhills and the eastern part of Carolina, where high soil temperatures make the cultivation of the Latham variety impossible.

The Cameron dewberry, produced by the same breeder, was derived from the cross Lucretia x Young. It combines to a large extent the good flavour of Young with the firmness and consequent transportability of Lucretia. It is resistant to leaf spot diseases.

855.

HUBER, G. A. and

634.711-2.7-1.521.6:575(75.3)

SCHWARTZE, C. D.

634.711-2.8

Resistance in the red raspberry to the mosaic vector *Amphorophora rubi* Kalt.

J. Agric. Res. 1938 : 57 : 623-33.

The aphid *Amphorophora rubi* is the chief vector of mosaic of red raspberries in the western Washington.

Fixed numbers of *A. rubi* were placed on shoots of 27 varieties of red raspberry in the greenhouse. The aphid failed to reproduce and maintain its population on the varieties Indian Summer, Lloyd George, Pyne Imperial and Pyne Royal, and reproduction was slow and the population remained small on the varieties Antwerp, Herbert, Marcy and Newburgh. The aphid reproduced abundantly on the remaining 19 varieties.

Varieties which showed high resistance to the aphid in the greenhouse were not attacked in the field, and those which showed partial resistance had small aphid populations.

Greenhouse tests with raspberry seedlings showed that resistance to *A. rubi* could be transmitted. The variety Lloyd George, which is highly resistant, was found to give both resistant

and susceptible progeny in crosses with susceptible forms, so that it must be heterozygous for the character. It appears likely that the varieties Chief, Cuthbert, Latham and Newman are homozygous for susceptibility.

The results indicate that breeding for resistance to *A. rubi* should be relatively easy.

856. GUSTAFSSON, Å. 634.715:576.356.5:576.312.35

Differential polyploidy within the blackberries.

Hereditas, Lund 1939 : 25 : 33-47.

A study of the incidence of polyploid forms among wild European and American *Rubus* species belonging to the groups Eubati veri and Rubi Corylifolii. A list is given of the chromosome numbers of a large number of Scandinavian forms belonging to these groups.

857. 634.72-2.421.1-1.521.6:575:578.08

BAUER, R.

634.72-2.483-1.521.6:575:578.08

Die Methode der Masseninfektion bei der Züchtung meltau- und blattfall-resistenter Rassentypen bei der Gattung *Ribes*. (**The method of mass infection in the breeding of varieties resistant to mildew and leaf fall in the genus *Ribes***).

Forschungsdienst 1938 : 6 : 575-84.

A suitable technique for the artificial inoculation of seedlings of *Ribes* with spores of *Sphaerotheca mors uvae* and *Gloeosporium ribes* is described. A suspension of spores is sprayed on to the plants with an atomizer and allowed to dry. The plants are subsequently kept in the greenhouse at 18 to 22° C. for 24 hours in a saturated atmosphere, at the end of which time relative humidity of the air may be reduced to 80 to 90 per cent. The optimum conditions of infection for the two fungi are closely similar, so that a mixture of spores may be used and the two tests performed simultaneously.

Gloeosporium may be cultured on artificial media, but *Sphaerotheca*, an obligate parasite, must be maintained on living plant material. This fungus may be carried through the autumn on *Ribes* plants which have been cut back so that they produce new shoots. In the winter, suitable host material may be obtained either by giving a low temperature shock to *Ribes* plants so that they proceed to grow without a winter period of dormancy, or by growing seedlings of *Ribes alpinum*. The suspension of spores is obtained from infected plants by spraying them with water.

858. KOMAREV, V. V. 634.75:575(47)

(**On new varieties of strawberries**).

Plodoovoščnoe Khozaistvo (Fruit and Vegetable Growing) 1938 : No. 11 : 63-64.

A note on the performance of the varieties Komsomolka, Mysorka, No. 13-37 (Cf. "Plant Breeding Abstracts", Vol. IX, Abst. 859) and No. 145, also bred by Petrov. All four gave high yields of berries of superior flavour.

859. PETROV, A. V. 634.75:575(47)

(**Strawberry varieties that have been bred and their commercial importance**).

Plodoovoščnoe Khozaistvo (Fruit and Vegetable Growing) 1938 : No. 11 : 62-63.

Strawberry breeding has been conducted at the Moscow Experiment Station for Fruit and Berries since 1924, and a description is here given of five new hybrid varieties of strawberries, Mysorka, Komsomolka, No. 13-37, No. 16-129 and No. 16-139. The first and last named are winter-hardy and all have given high yields, especially Komsomolka. The latter and No. 16-129 produce only pistillate flowers and require pollinators.

The quality of the fruit is declared to be satisfactory.

860. GUTIERREZ, M. E. 634.75:575(91.4)

Plant-to-the-row tests on seedlings of strawberry.

Philipp. J. Agric. 1938 : 9 : 335-45.

Selection of strains derived from seed collected from strawberry varieties of American origin is being continued, in the hope of obtaining varieties better adapted to Philippine conditions than the parent forms. Several strains derived from the varieties Wilson, Missionary and Mastodon, two from each of the varieties Bellmar and Big Joe and one from Fairfax appear to be promising and are to be tested on a larger scale.

Seed obtained from the above strains has also been collected and the seedlings so obtained are to be compared with vegetatively propagated rows of their parents.

VITICULTURE 634.8

861. STOUT, A. B. 634.835:575(73)

Some chronicles in grape history. I and II.

J. N.Y. Bot. Gdn 1938 : 39 : 254-63, 274-81.

The history of grape cultivation and breeding work in the eastern United States is briefly reviewed. *Vinifera* grapes are unsuited to growth in this region, and most of the breeding work carried out has been an attempt to combine the good fruit qualities of *vinifera* grapes with the hardiness and other desirable qualities of various native species. *Vitis Labrusca* has been the most important species used in this connexion, though *V. vulpina*, *V. aestivalis*, *V. candicans* and *V. rupestris* have also been used to a greater or less extent. *V. rotundifolia* is important in many parts of the southern States.

Extensive grape breeding work is now being done at several state agricultural experiment stations and by the United States Department of Agriculture. No native grape at present in cultivation is well adapted for cultivation in diverse conditions, and they all have some rather decided defects, so that there is still room for much further improvement.

862. OBERLE, G. D. 634.835:575.11:581.162.51(74.7)

A genetic study of variations in floral morphology and function in cultivated forms of *Vitis*.

Tech. Bull. N.Y. St. Agric. Exp. Sta. 1938 : No. 250 : Pp. 63.

Wild vines are either male-sterile or female-sterile, while among cultivated varieties functionally hermaphrodite forms also occur. The following factorial scheme is put forward on the basis of a genetic study of the progeny of 716 different parental combinations of various *Vitis* species and cultivated varieties:—

Male sterility is determined by a single recessive gene *sp* and female sterility by a dominant gene *So*. Female-sterile individuals have the constitution *So so Sp sp* and male-sterile individuals *so so sp sp*, but as the two factors *So* and *Sp* are absolutely linked, the cross female-sterile x male-sterile gives only the parental forms in a 1 : 1 ratio.

Hermaphrodite plants may either have the constitution *so so Sp sp* or *so so Sp Sp*, the two types being distinguishable by their breeding behaviour.

In the majority of crosses, a deficiency of female-sterile individuals was observed, a deficiency which also exists in wild populations. It is postulated that this type of flower is associated with differential viability factors.

It appears that occasional female-sterile forms may have the constitution *So so Sp Sp*.

It is considered likely that the hermaphrodite form was primitive in *Vitis* and methods by which the present functionally dioecious, wild populations may have arisen from hermaphrodite ancestors are discussed.

FORESTRY 634.9

863. LANGLET, O. 634.97:576.16

Proveniensförsök med olika trädslag. Översikt och diskussion av hittills erhållna resultat. (**Researches on place of origin of various trees.**

A review and discussion of the results hitherto obtained).

Svenska SkogsvFören. Tidskr. 1938 : Nos. 1-2 : 55-278.

The effect of the locality as shown in the variations of morphological and physiological

characters is considered in more or less detail for a number of species of trees: *Pinus*, *Abies*, *Chamaecyparis*, *Cryptomeria*, *Juniperus*, *Picea*, *Pseudotsuga*, *Taxus*, *Thuja*, *Tsuga*, *Larix*, *Acer*, *Alnus*, *Betula*, *Caprinus*, *Fagus*, *Fraxinus*, *Quercus*, *Robinia*, *Tectona*, *Acacia*, *Bombax*, *Castanea*, *Juglans*, *Liriodendron*, *Platanus*, *Populus*, *Prunus*, *Terminalia* and *Ulmus*. The effect of the locality on the variability of inherited characters is also discussed in some species.

864. GOIDÀNICH, G. and AZZAROLI, F. 634.972.8-2.484-1.521.6
 Relazione sulle esperienze di selezione di olmi resistenti alla grafiosi e di inoculazioni artificiali di "*Graphium ulmi*" eseguite nel 1937. (**Report on the experiments of selection of elms resistant to elm disease and of artificial inoculations of *G. ulmi* made in 1937**).
 Boll. Staz. Pat. Veg. Roma 1938 : 18 (N.S.) : 149-78.

Ulmus pumila shows a marked resistance to attack by *G. ulmi* but when grafted on to *U. campestris* this resistance may be lost. Most of the hybrids of *U. pumila* are susceptible but resistance may be maintained and certain of these plants have been selected. *U. campestris* is very susceptible, plants of *U. montana* and *U. laevis* have proved resistant. The resistance of the new Dutch variety, Cr. Buisman, was confirmed. Other foreign varieties of less importance were also tested.

865. LANGLET, O. 634.975:575:581.02
 Om miljö och ärftlighet samt om förutsättningarna för växtförädling av skogsträd. (**On environment and heredity and the requirements for breeding forest trees**).
 Noorlands SkogsvFörb. Tidskr. 1937 : No. 1 : 49-99.

After a short introduction regarding the discussion on the question of races in the fir (*Pinus sylvestris* L.) the importance of the environment is considered. Photographs show that some of the variations in the shape of the crown are due to external conditions and some are in all probability inherited. Without much further research it is impossible to distinguish every variation as being either inherited or due to environment.

The effect of the environment on breadth of crown and degree of branching in the fir appears to dominate the genetic factors but in some cases the formation of the crown is apparently influenced by heredity.

VEGETABLES 635

866. IVANOFF, N. N. 635:575.12:577.16
 634:575.12:577.16
 (**A study of vitamins in plants**).
 Suppl. 84 Bull. Appl. Bot. Leningrad 1937 : 4-20.

Among other points, variation in the vitamin content of and within varieties as well as in hybrids of various fruits and vegetables is discussed. Instances of increased vitamin content in the F_1 in crosses of peppers and of raspberries are cited.

A further study of inheritance is contemplated as the available data on hybrids are inadequate.

867. TATEBE, T. 635.15:575.11.061.6:581.43
 635.15:575.11.061.634
 (**On inheritance of root colour in *Raphanus sativus* Linn.**).
 Jap. J. Genet. 1938 : 14 : 39-50.

A study of the inheritance of root colour in a number of radish crosses led to the conclusion that the various colour types were of the following genetic constitution: white, *rrBByy*; red, *RRbbyy*; purple, *RRBByy*; yellow, *rrBBYY* or *rrBbYY* and black, *rrBBY^bY^b*. The cross red x white gives a purple F_1 and an F_2 consisting of 9 purple: 3 red: 4 white. It therefore appears that *B* is a factor which produces no colour alone, but acts in conjunction with the

R factor to produce purple pigment. The crosses yellow x white, black x white, and black x yellow all give single factor ratios in the F_2 , the first alternative being dominant in each case. It therefore appears that the colours black, yellow and white are determined by a series of multiple allelomorphs. Purple x white and purple x red crosses also give 3 : 1 ratios, purple being dominant. In the cross purple x black, the F_1 is blackish purple, and the F_2 gives a 9 : 3 : 3 : 1 ratio of blackish purple, purple, black and white. Red x black gives a blackish purple F_1 and an F_2 consisting of 27 blackish purple : 9 purple : 9 blackish red : 3 red : 12 black : 4 white. Yellow x purple gives 12 purple : 3 yellow : 1 white, and red x yellow gives a 9 : 3 : 3 : 1 ratio of purple, red, yellow and white.

The variety Cincinnati Market was found to be heterozygous for a lethal gene for seedling chlorophyll deficiency, κ_a .

868.

WERNER, G.

635.15:581.162.5:575.14

633.425:581.162.5:575.14

Untersuchungen über die Selbststerilität beim Radies (*Raphanus sativus*) und Kohlrabi (*Brassica oleracea* varietas *gongyloides*). [Investigations on self-sterility in the radish (*R. sativus*) and Kohlrabi (*B. oleracea* var. *gongyloides*)].

Z. Zücht. 1938 : A 22 : 588-629.

Comparisons were made between the fertility of 3 strains (A_1 , A_2 , A_3) derived from a randomly selected heterozygous radish plant of the "Non plus ultra" variety and inbred for several generations. The fertility of the sibs of each generation was recorded for purposes of comparison. Fertility was estimated by the number of seeds set in repeated pollinations.

The homozygosity of the strains increased with each generation and the habit, development and degree of self-sterility of the sibs also became more uniform. In most families the decrease in heterozygosity was accompanied by a corresponding reduction in vigour and self-fertility. The marked differences, however, in the lowest limits of self-fertility attained by inbreeding indicated that the heterozygosity for the fertility factors was not the sole determining cause of the degree of self-fertility.

The eventual isolation, by the process of inbreeding, of lines differing widely in their self-fertility and also in the lowest limits of self-fertility attained suggests that the original parent plant (No. 1036) must have carried different polymeric factors inhibiting and promoting self-fertility. In all the strains some lines showed a gradual reduction in self-fertility, but other lines exhibiting an increasing self-fertility were also observed. Evidence of a complementary action of fertility genes was also found.

Some instances in which pollination by sibs gave better results than selfing occurred in certain families in which signs of heterozygosity were more or less marked. The greater success of cross pollination noted in general is interpreted as an indication of the superior fertility of plants with different fertility and sterility factors; and a higher set following sib pollination as compared with the set obtained from selfing, indicates the existence of genotype differences within a family.

Marked differences were observed in some combinations between the direct cross and the reciprocal: in general, however, such differences were slight.

In general no close correlation was found between vigour, sexual reproductive capacity and self-fertility.

A similar investigation with kohlrabi pointed to the operation of polymeric factors in conditioning the self-sterility and self-fertility, several factors being involved in determining the behaviour of each individual plant. None of the schemes hitherto suggested in explanation of variation in sterility and fertility proved applicable to elucidate the conditions in kohlrabi, though the differences again found in the results from reciprocal crosses agree in the main with the oppositional factor hypothesis.

In kohlrabi too no close correlation was found between plant vigour and the degree of self-fertility.

A full critical discussion of the results with copious references to the findings of other workers concludes the paper.

869. STELZNER, G. and SCHWARZE, P. 635.24:575
 Untersuchungen zur Züchtung des Topinamburs (*Helianthus tuberosus*).
Investigations on the breeding of the Jerusalem artichoke (*H. tuberosus*).
 Züchter 1939 : 11 : 14-17.

The fact that seed only ripens rarely in Germany is one of the difficulties of breeding artichokes. Clones have therefore been grown in countries with warmer climates for the production of seed. It is desired to select strains which give both increased yield of tubers and are of more value for fodder.

870. MAGRUDER, R., BOSWELL, V. R., SCOTT, G. W., WORK, P., and HAWTHORN, L. R. 635.41(73)
Descriptions of types of principal American varieties of spinach.
 Misc. Publ. U.S. Dep. Agric. 1938 : No. 316 : Pp. 60.

The most important American spinach varieties are fully described, with accompanying photographs. The origin of each variety is noted and a list of synonyms given.

871. NELSON, R., COONS, G. H. and COCHRAN, L. C. 635.53-2.484-1.521.6:575(77.4)
 635.53 Michigan Golden
The *Fusarium* yellows disease of celery (*Apium Graveolens* L. var. Dulce D.C.).
 Tech. Bull. Mich. Agric. Exp. Sta. 1937 : No. 155 : Pp. 74.

A very full description is given of the *Fusarium* yellows disease of celery, caused by *Fusarium apii* and *F. apii* var. *pallidum*. As these fungi are persistent soil organisms, the breeding of resistant varieties is the only efficient method of control of the disease.

The first celery breeding work done in Michigan with the aim of producing a *Fusarium* resistant self-blanching variety, led to the production of a resistant strain of dwarf Golden Self-Blanching, which was ready for extensive field trials in 1925. By this time, however, dwarf celery varieties were no longer in demand, as several tall types of self-blanching celery had been introduced, notably Vilmorin's tall strain of Golden Self-Blanching and Golden Plume. Selection of these varieties for resistance to yellows was commenced in 1929. Several selections were made of surviving plants in fields of tall Golden Self-Blanching in which disease incidence was high. One of these plants was subsequently inbred for two generations and the progeny was found to be highly resistant to yellows and to show no infection at all under field conditions. The variety is now released as Michigan Golden, and is intermediate in type between Golden Self-Blanching and Golden Plume.

The method of production of the Curly Leaf Easy-Blanching variety is also outlined. This is a quick-blanching green variety bred from an off-type plant of Newark Market, which has shown high resistance to yellows.

872. SINNOTT, E. W. 635.61/3:581.145:575-181
Developmental factors affecting inherited differences in fruit size in cucurbits.
 Genetics 1939 : 24 : p. 85. (Abst.).

A developmental study of the size and number of cells at various stages in the growth of fruits of cucurbit types which have markedly different fruit size at maturity.

873. SINNOTT, E. W. and 635.62:576.356.5:581.04:575-181.12
BLAKESLEE, A. F. 635.627:576.356.5:581.04
Changes in shape accompanying tetraploidy in cucurbit fruits.
Science 1938 : 88 : p. 476.

SINNOTT, E. W.,
BLAKESLEE, A. F. and
WARMKE, H. E.

The effect of colchicine-induced polyploidy on fruit shape in cucurbits.

Genetics 1939 : 24 : 84-85. (Abst.).

Chromosome doubling was induced by colchicine treatment in a number of pure lines of *Cucurbita pepo* and *Lagenaria vulgaris*. The cell size was considerably increased in most of the tetraploids, but the fruit was not always larger. The tetraploid fruits were markedly wider and shorter than the diploid. This difference in shape is apparent in the early fruit primordium, and differences in the relative growth rates in length and width during development were established in several cases. These changes in fruit shape are rather like others caused by genes, e.g. a type which is a "sphere" as a diploid becomes converted into a flattened form resembling the "disk" type in the tetraploid phase.

874. AFIFY, A. 635.63:576.353:576.312.34
Singleness or doubleness of the chromosomes in the successive stages of mitosis.
Cytologia, Tokyo 1938 : 9 : 319-33.

The author concludes from a study of root tip material of *Cucumis sativus* that the chromosomes consist of double threads from the earliest observable stage of mitotic prophase; that the two threads separate at anaphase, and that the mitotic anaphase and telophase chromosomes are single structures.

The chromosome number of the species is reported as $2n = 14$.

The resting nucleus has two nucleoli, which were observed to fuse in early prophase.

875. SEATON, H. L. and 635.63:581.162.3
KREMER, J. C.
Recent investigations of factors influencing pollination and their effect on shape of pickling cucumbers.

Fruit Prod. J. and Amer. Vinegar Indust. 1938 : 17 : p. 270. (Abst.).

Pollination of cucumbers in the field by honey bees is shown to be essential to the development of the fruit and only three fruits, which were seedless, were obtained from 997 flowers on caged plants which were not artificially pollinated or pollinated by bees. The bees normally carry enough pollen to ensure the production of straight fruits.

876. LESLEY, J. W. 635.64:575.242:575.11
The midget tomato. A new gene mutant.
J. Hered. 1938 : 29 : 393-94.

The "midget" mutant is of small size and has a dense, cushion-like growth habit. It produces very little pollen. Breeding experiments suggest that it is due to a single recessive gene associated with low viability.

877. WOODCOCK, E. F. 635.64:576.356.52:581.45
Vegetative anatomy of the tomato (*Lycopersicum esculentum* Mill.).
III. Diploid and haploid plants.
Pap. Mich. Acad. Sci. (1937) : 1938 : 23 : 243-45.

A haploid plant of the Marglobe tomato was compared with diploid plants of the culture from which it arose. There were no marked internal anatomical differences between the haploid and the diploids, but the former was distinguished by a dwarfed habit, a smaller number of hairs on the leaf blade and narrower leaflets.

878. KOPETZ, L. M. 635.64:581.47:575
 Blütenuntersuchungen bei Tomaten und Paprika. Ein Beitrag zur Frage
 der Sortensystematik. (**Investigations on the flowers of tomato and
 paprika. A contribution to the question of variety systematics**).
 Züchter 1939 : 11 : 19-22.

Examination of the ovaries of flowers of tomato and paprika even when still in bud showed that in the tomato there were direct correlations between number of ribs on the ovary and the number of loculae, shape of the ovary and shape of the fruit and indirect correlation between the number of ribs on the ovary and the fruit size or fruit weight.

In paprika the correlations were between shape of the ovary, pointed, blunt and rounded and the shape of the fruit and the colour, green and yellow of the ovary and fruit colour.

879. ALEXANDER, L. J. 635.64-2.484-1.521.6:575.127.2(77.1)
The new leaf mold resistant tomato.

Proc. 23rd Annu. Mtg Ohio Veg. Gr. Ass. 1938 : 64-69.

Three strains of tomato resistant to leaf mould (*Cladosporium fulvum*) have now been released on a small scale for further testing. They were produced by repeated back-crossing to the commercial varieties Globe and Marhio, with subsequent selection, of the progeny of a plant believed to be a natural hybrid between Globe and the Red Currant tomato (*Lycopersicum pimpinellifolium*), (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 666).

The new strains have a yielding ability apparently equal to Globe in the absence of leaf mould, and very much superior to it when leaf mould is serious. The proportion of the crop falling in the Select grade is higher than in Globe, so that the value of the crop is greater.

Further pure lines are being developed for testing, and experiments are also being made with crosses between different pure lines, to see whether the F_1 plants exhibit heterosis.

880. MORRISON, G. 635.64.00.14(73)
Tomato varieties. 635.64:575(73)

Sp. Bull. Mich. Agric. Exp. Sta. 1938 : No. 290 : Pp. 68.

A description, with illustrations, of the most important tomato varieties of the United States. A brief introductory section deals with the history of tomato breeding work in the States, and with present-day breeding methods and objectives.

881. MILLER, J. C. and 635.648:575(76.3)
 WILSON, W. F.
A preliminary report on okra breeding.

Proc. 39th Annu. Convent. Ass. S. Agric. Wkrs, Atlanta, Ga 1938 : p. 106.
 (Abst.).

Selection for pure strains of the standard varieties of okra is being conducted. A promising strain of the velvet type, known as Louisiana Velvet is now ready for distribution.

It appears that the character angular pod differs from the recessive round pod by two pairs of duplicate factors.

882. KOVARSKII, A. E. 635.65:575.127.2:575"793"
 635.65-2.8-1.521.6:575
(Breeding legumes for resistance to virus mosaic diseases).

Seleksija i Semenovodstvo (Breeding and Seed Growing) 1938 : No. 10 :
 13-15.

Individual plant selections for mosaic resistance in *Phaseolus aureus*, *P. acutifolius* and *Vigna sinensis* indicated that late forms were much more severely infected than the medium early or early forms. Further observations on biotypes of *V. sinensis* and *P. aureus* obtained from imported and from local material led the writer to conclude that the rapid degeneration due to mosaic in the above 3 species under northern conditions must be attributed to delayed developmental phases and that degeneration can best be combated by measures to ensure rapid phasic development, e.g. vernalization, and the breeding of mosaic-resistant varieties.

In 1937 the cross *V. sinensis* x *V. catyang* was made, the first parent being highly susceptible to mosaic owing to a slow photo-stage, and the second parent partly susceptible owing to a slow thermo-stage. From this combination an early plant which remained quite free from mosaic was obtained. In the F_1 dominance of the two short stages of development led to the production of early mosaic-resistant plants. Hence in breeding *V. sinensis* for resistance to mosaic, parents differing in the rate of their developmental stages should be chosen to ensure the production of early maturing plants.

These results are to be applied in breeding for mosaic resistance in *Phaseolus* and also in the study of legumes in relation to other parasitic infections.

883. CAMARA, A. de Sousa da 635.651:576.354.4:537.531
Die Wirkung von Roentgenstrahlen auf die meiotischen Chromosomen
der *Vicia Faba* L. (**The effect of X-rays on the meiotic chromosomes
of *V. Faba* L.**).

Bol. Soc. Broteriana 1938 : 13 : 187-209.

The flower buds were treated with doses of 65 kv., 5mA at a distance of 30 cm. without a filter for 15-20 mins.

The effect on the chromosomes is described and the results are discussed in relation to those of other workers.

884. FRETS, G. P. 635.652:575.11-18:581.143
De groei van boonen. (**The growth of beans**).
Erfelijkheid in Praktijk, Leiden 1938 : 3 : p. 142.

Discussing the length and breadth indices in the course of growth of beans of the lines I and II (Cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 285) the author concludes that the length and breadth dimensions do not increase at an equal rate. At the earliest stage of growth the breadth increases more rapidly than the length and this rate decreases as growth proceeds. From the earliest stage onwards the beans exhibited the shape typical of lines I and II.

885. BARRONS, K. C. 635.652-2.6-1.521.6:575(76.1)
**Breeding horticultural crops for resistance to the root-knot
nematode.**
Proc. 39th Annu. Convent. Ass. S. Agric. Wkrs, Atlanta, Ga 1938 : 106-07.
(Abst.).

An exhaustive search for strains of *Phaseolus vulgaris* resistant to root knot caused by nematodes, led to the discovery of two highly resistant forms. One of these, Alabama No. 1, is also drought resistant, and appears to be an outstanding variety for the southern United States. It is being introduced in 1938. These root-knot resistant strains are being used as parents in further breeding work.

A method has been evolved at the Alabama station by which the root-knot resistance of beans and cowpeas can be determined in the seedling stage under controlled greenhouse conditions.

886. MOORE, W. D. 635.652-2.8-1.521.6(75.7)
635.652-2.484-1.521.6(75.7)
Field studies of certain diseases of snap beans in the Southeast.
Tech. Bull. U.S. Dep. Agric. 1938 : No. 647 : Pp. 28.

Data are presented as to the relative susceptibility of 26 varieties of snap bean (*Phaseolus vulgaris*), grown under field conditions at Charleston, S.C., to mosaic and to dry root rot (*Fusarium martii phaseoli*). Various other field experiments on snap beans are also reported.

887. WADE, B. L. and 635.652-2.8-1.521.6:575(73)
ZAUMEYER, W. J. 635.652 U.S. No. 5 Refugee
U.S. No. 5 Refugee, a new mosaic-resistant Refugee bean.
Circ. U.S. Dep. Agric. 1938 : No. 500 : Pp. 12.

A description of the *Phaseolus vulgaris* variety U.S. No. 5 Refugee. This was selected from a cross between U.S. No. 1 Refugee and a rogue strain of Stringless Green Refugee which was immune to common bean mosaic.

The new variety, which was first released in 1935, is very similar to Stringless Green Refugee in plant and pod characters, and is apparently immune to the mosaic. It has certain other advantages as a bean for canning purposes and outyields other Refugee strains where common bean mosaic infection is a factor.

888. WALKER, J. C. 635.652-2.8-1.521.6:575(73)
Varieties of beans for canning.

Canner 1937 : 84 : 124-25 ; also Canning Tr. 1937 : 59 : 120-21.

A discussion of the mosaic resistant strains of Refugee bean, Idaho Refugee, Wisconsin Refugee and U.S. 5 (cf. Abst. 887 and "Plant Breeding Abstracts", Vol. VII, Abst. 1393).

889. MAGRUDER, R. 635.653:575(77.1)
Baby Fordhook, a new small thick-seeded bush lima bean.
 Canner 1938 : 86 : No. 8 : 18, 19.

This variety was produced by continued selection in the progeny of the cross Fordhook x Henderson Bush. It was produced primarily as a canning or freezing lima bean, combining the quality of Fordhook and the small size and productivity of Henderson.

890. SESSOUS, G. and SCHILLER, K. 635.655:581.192:575.42
Grundsätzliches zur chemischen Auslese bei der Sojazüchtung. (Fundamentals for chemical selection in the soya bean).
 Züchter 1939 : 11 : 1-14.

A comparison of the results of fat and nitrogen analyses from large and small samples taken from a pure line showed that even in the large samples there was considerable variation. No correlation could be found between fat or protein content with colour or glossiness of the seeds. The relation between fat and protein content is studied in detail.

The fat content of the seeds decreases from below upwards, in their position on the plant, while the protein content increases. A long period of development favours fat formation, a shorter period protein formation.

Detailed analyses are given of the percentage of fat and protein in pods from different branches on a number of plants.

891. KOCH, L. 635.655-1.524.2:575.42(49.2)
Proeven met sojaboonen. (Tests with soya beans).
 Erfelijkheid in Praktijk, Leiden 1939 : 4 : 148-50.

The possibility of growing soya beans as a crop in Holland has been explored and selected strains from imported seed have been isolated during the past five years. Some of them have proved resistant to virus disease and are regarded as suitable material from which varieties for Dutch conditions can be built up.

Experiments on artificial hybridization are also described and the occurrence of three presumed natural hybrids is recorded.

892. NILSSON, E. 635.656:575.116.1
Erblichkeitsversuche mit *Pisum*. X. Die Koppelungsgruppen *Pa-R-Tl-Btb* und *Wlo-P-Pl*. (Inheritance experiments with *Pisum*. X. The linkage groups *Pa-R-Tl-Btb* and *Wlo-P-Pl*).
 Hereditas, Lund 1939 : 25 : 48-64.

It is shown that the genes *Pa* and *Btb*, placed by Winge in linkage group 3, and *R* and *Tl*, placed in group 7, actually form a single linkage group. *Pa*, *R* and *Tl* are situated relatively close together, while *Btb* shows 37 to 40 per cent of crossing-over with them. It was not possible to decide from the data whether the gene order was *Pa R-Tl Btb* or *Tl-R-Pa-Btb*. The gene pairs in question determine the following characters: *Pa-pa*, green v. pale pods; *R-r*, round wrinkled seed; *Btb-btb*, blunt v. acute pod apex; *Tl-tl*, tendrilled v. acacia leaves. In a second group of experiments, the gene pair *Wlo-wlo* (waxy v. waxless leaf surface) was

shown to be linked with *P* ϕ (thin parchmented membrane in pod *v.* no membrane) and *Pl-pl* (dark *v.* light hilum). There was from 6 to 20 per cent of crossing-over between *Wlo* and *P* and 32 per cent between *Wlo* and *Pl*. *P* and *Pl* were linked with from 25 to 32 per cent of crossing-over. The gene order therefore appears to be *Wlo-P-Pl*. Large differences in linkage values between *Wlo* and *P* in the coupling and repulsion phases were found, but as the respective crosses were made in different years, differences in environmental conditions may have been responsible. There was no evidence of linkage between the genes *Wlo* and *R*, *I*, *Le* or *V*, nor between *Le* and *P* or *Pl*.

893. SUTTON, E. 635.656:576.356.2:576.356.4
Trisomics in *Pisum sativum* derived from an interchange heterozygote.

Genetics 1939 : 24 : p. 88. (Abst.).

Numerical non-disjunction sometimes occurs in the ring of four chromosomes in Hammarlund's interchange heterozygote of *Pisum sativum* (K-line x N-line). The gametes with an extra chromosome may function. The shortest of the associated chromosomes is always the one present in the trisomic condition, and such trisomics are characterized by large bracts. Trisomic plants heterozygous for genes in this chromosome give abnormal ratios. It is suggested that the use of such trisomics provides a new method of establishing gene loci.

894. HOLDER, T. D. 635.656.00.14(73)
Behaviour of new varieties of peas in 1936.
 Canner 1937 : 84 : 113-15.

An account of variety trials with canning peas in the States of Maryland, Pennsylvania, New York, Wisconsin, Illinois and Minnesota in 1936.

895. ENZIE, W. D. 635.67:575(73)
New hybrid corn varieties.
 Canner 1937 : 84 : No. 17 : p. 21.

A description of some promising sweet corn hybrids tested at the New York State Agricultural Experiment Station, Geneva N.Y. in 1936.

896. HABER, E. S. 635.67-2.112-1.521.6:575:578.08
A study of drouth resistance in inbred strains of sweet corn *Zea mays* var. *Rugosa*.
 Res. Bull. Ia Agric. Exp. Sta. 1938 : No. 243 : 55-72.

It was found that observations of the following plant characters were of no use to the plant breeder as an indication of the drought resistance of inbred lines of sweet corn: transpiration rate, stomatal frequency on lower and upper leaf surfaces, volume of root system, number of nodes below soil level and number of vascular bundles per unit area of cross section of the stem. It was possible, however, to distinguish between drought-susceptible and resistant lines by keeping plants of comparable age at a temperature of 55° C. for five hours.

897. POOLE, C. F. 635.67-2.7-1.521.6:575(75.7)
Inbreeding and earworm resistance in sweet corn.
 Proc. 39th Annu. Convent. Ass. S. Agric. Wkrs, Atlanta, Ga 1938 : p. 107.
 (Abst.).

Inbred lines of sweet corn showed significantly greater variation with respect to earworm resistance than sib-pollinated lines of the same parent material. This is due to the segregation of genes for resistance to earworm.

BOOK REVIEWS

BUROS, O. K. (Editor).

519:578.08:016

Research and statistical methodology: books and reviews 1933-1938.

Rutgers University Press, New Brunswick 1938 : \$1.25. Pp. vi + 100.

The aim of the compiler of this book is to promote the teaching of correct methods of statistical analysis by collecting together in one place reviews of statistical books, and listing as many books as possible, together with quotations from the reviews which have been traced, references being given in all cases. The material has been reprinted from *The 1938 Mental Measurements Year Book of the School of Education of Rutgers University*.

The conception is original, and is to be welcomed in providing a useful reference work for the statistician, who is enabled by this means to see whether there is any important work that he has missed seeing. "Plant Breeding Abstracts" stands out as a publication which has reviewed most of the important books on statistics published during the last few years. If the notices of the present reviewer can be taken as a fair sample of the whole, for purposes of examination, then it should be said that, while the reviews are not often quoted in full, the editor has in all cases given lengthy and fair quotations, while few slips have been noticed. The reference to B 659 in the index under Wishart should read B 660, and the same reviewer's notice under B 630 has apparently got in by mistake, since it is a review of another publication not included in this volume.

J. W.

BURGESS, T. O.

519.24

Elementary statistics and graphics.

Burgess Publishing Company, Minneapolis, Minnesota 1938 : \$1.00. Pp. 32.

10 figs. 8 tables. (Mimeographed).

A treatment of elementary statistics designed for the school teacher with very little mathematical knowledge. The construction of frequency histograms and polygons is described, also the significance and method of determination of the mode, median, mean, and standard deviation. Skew curves are briefly mentioned, and a formula given for the calculation of the correlation coefficient.

The book is too brief and of too elementary a nature to be of much practical value to agricultural scientists.

HOLMAN, L. J.

519.24

Simplified statistics.

Sir Isaac Pitman and Sons, Ltd., London 1938 : 3s. 6d. Pp. xii + 142 + 32.

12 figs. 7 tables.

This is a briefly written and useful little book on statistics, written on a plan which is novel in statistical literature, though it has become familiar to mathematicians through S. P. Thompson and his *Calculations Made Easy*. The book provides an easy and pleasant way of grasping the underlying laws and of absorbing the formulae, "the idea being that the student reads it straight through without trying particularly to understand or remember anything at all". Typical of the book is the fact that the author refuses at the beginning to give a definition of statistics. At the end he still refuses! He appears to have the needs of the business statistician in mind, but anyone who wishes to know what the subject is all about can read the book with profit to himself. The matter dealt with includes the "bell-shaped curve" (i.e. normal), sampling and prophesying, the standard deviation, "curves of averages", association and correlation, permutations and combinations, probability and chances, the simple formula for "sigma" and finally "warnings and advice". Simple algebra and arithmetic is all that is used.

J. W.

MARBE, K.

519.24

Das Ausgleichprinzip in der Statistik und verwandte Probleme. (The equalization principle in statistics and related problems).

C. H. Beck, München 1938 : Pp. 164. 60 tables.

In this book the author develops further the ideas put forward in a previous publication of his: "Grundfragen der angewandten Wahrscheinlichkeitsrechnung und theoretischen Statistik, 1936", which has also been reviewed (Cf. "Plant Breeding Abstracts", Vol. VI, p. 449).

The investigation of the properties of "populations" is carried further in the light of a more thorough examination of vast statistical material collected by the author.

He again opposes a certain hypothesis, on which many results of the classical theory of probability are based, namely the hypothesis that the individual observations of a population are independent of one another. This independence if restated in terms of the author's favourite example, would infer that the chance of scoring a red number with a roulette does not depend on the previous scores of this roulette. The author, on the other hand believes that generally there exists a certain correlation between the observations, for which he has introduced the term: "Statistical Equalization". In terms of another of the author's examples this correlation means that the chance for a new-born to be a boy is larger after a sequence of female births than after a sequence of males.

It is obvious that the author does not doubt the correctness of the mathematical arguments by which results are derived from the classical assumptions, on the other hand he refutes the above fundamental assumption as being incapable of explaining the facts.

To prove his thesis, i.e. to demonstrate a tendency towards "Statistical Equalization", the author examines German birth records and Monte Carlo roulette scores. All his tests purport to show that the frequency of large "runs" of births of the same sex (or roulette scores of the same colour) is smaller than would be expected on the classical theory (binomial distribution).

R. von Mises, however, has rightly pointed out that most of the findings of the author may be explained as a consequence of the skewness of the Poisson distribution (the limiting form of the binomial for small expectations).

The last chapter, however, brings some evidence in favour of the author's point: here the frequency distribution of the "runs" mentioned above is compared with the Poisson distribution.

H. O. H.

SNEDECOR, G. W.

519.24:631.421

Statistical methods applied to experiments in agriculture and biology.

Collegiate Press, Inc. Ames, Iowa 1938 : Pp. xiii + 388. figs. tables.

Revised Ed.

This book, described by the reviewer at the time as a comprehensive treatise on statistical and experimental methodology for the practising biologist, with a strong bias towards agricultural experimentation, was published in 1937, and a revised edition has now appeared. The additions and alterations are not referred to in the introduction, but inspection shows that in the main the material of the original edition is unaltered. A changed example here, the addition of a little explanatory matter there, has improved the work, particularly in the section dealing with proportional sub-class numbers. The book has been increased in size, however, by the incorporation of a number of new chapter sections. These deal with: rates and percentages, size of sample, correlation between mean and variance, randomized blocks in several localities and seasons, perennial plants in randomized blocks, and regression with four varieties, including tests of significance. These perform the useful function of bringing the subject-matter up-to-date, for even in the short period of one year a number of advances have been made, and it is good that the student should be made familiar with the latest developments.

J. W.

ROEMER, T. and

RUDORF, W.

575:633

Handbuch der Pflanzenzüchtung. (Manual of plant-breeding).

Paul Parey, Berlin 1939 : Vol. II : Lief. 5 : pp. 1-80 : 15 figs. tables ; Vol. I :

Lief. 6 : pp. 241-88 : 52-56 figs. 12-15 tables ; Vol. IV : Lief. 6 : pp. 81-112 :

19-22 figs. 3 tables. RM. 6.50† each part.

The fifth issue is the first part of Vol. II on the breeding of the main cereals. It starts with a section on general principles and is followed by a completed section on rye breeding and an incompleting section on maize.

† 25 per cent reduction outside Germany.

The first part of the sixth issue continues with the general theories of Vol. I, the second part is a continuation of Vol. IV in which the section on *Beta* is completed and a section on the potato is begun. Subscribers should note that page 288 of Vol. I in the middle of this number ends with an unfinished sentence in small type but the following page, which begins in the middle of a sentence in the normal type, is page 81 of Vol. IV. This issue must therefore be broken for binding.

BLARINGHEM, L.,

BERTRAND, P.,

GUÉRIN, P. and

STOMPS, T. J.

575.1:575.24:576.12

Hérédité, mutation et évolution. L'oeuvre de Hugo de Vries. (**Heredity, mutation and evolution. The work of Hugo de Vries**).

Masson et Cie, Paris 1937 : 6 fr. Pp. 94. figs.

This small book contains the following general articles:—The plant cell and heredity according to the work of Léon Guignard by L. Blaringhem; The work of Professor Hugo de Vries by T. J. Stomps; The origin of species derived from *Oenothera Lamarckiana*; Mutation or hybrids, according to Hugo de Vries and A. F. Blakeslee, by L. Blaringhem; On the presence of a fungus in rye grass by P. Guérin; The genealogical tree and the origin of species according to Charles Naudin by L. Blaringhem; The vegetation of the carboniferous period—its origin and evolution, by P. Bertrand.

CRANE, M. B. and

LAWRENCE, W. L. C.

575.1:634/5

The genetics of garden plants.

MacMillan and Co., Limited, London 1938 : 12s. 6d. Pp. xxi + 287.

2nd Ed. 62 figs. 43 tables.

The first edition of this book (Cf. "Plant Breeding Abstracts", Vol. V, p. 270) has become deservedly well known and the appearance of a second edition will be welcomed by all concerned with the genetic aspects of garden plants. The second edition follows the same lines as the first but several sections have been rewritten or enlarged and there are certain additions, notably a new chapter on the chemistry and genetics of flower colour and a list of chromosome numbers of some cultivated plants. Other additions, within the existing chapters, deal with qualitative and quantitative characters (Chapter I), linkage in *Zea Mays* (Chapter II), multiple genes (Chapter III), genetics and cytology of *Iris* species (Chapter IV), genetics of melons and heterosis (Chapter VI). These additions and the extensions and revisions of other sections have resulted in an increase of some 50 pages.

The book is one to be recommended as a standard work and is useful too for reference to the genetic analyses of particular plants.

J. L. F.

DARLINGTON, C. D.

576.12:575.1:576.3

The evolution of genetic systems.

University Press, Cambridge 1939 : 10s. 6d. Pp. x + 149. 26 figs.

This book is a very interesting attempt to outline the evolutionary significance of the more important genetic mechanisms and the way in which they have developed in the plant and animal kingdoms. After a preliminary description of the main features of genetic segregation and of normal mitosis and meiosis, the mode of origin and evolutionary significance of the various possible types of mutation are discussed. Inversion, translocation, polyploidy and aneuploidy are of course among the more important phenomena dealt with and there are also chapters on the evolution of sex-determining mechanisms, genotypic control of chromosome behaviour, on sterility, permanent hybrids, apomixis and other related topics.

The last two chapters, on "The Integration of the Cell" and "The Evolution of Heredity" are particularly interesting. The former deals largely with the significance of extra-nuclear genetic determiners ("plastogenes" and "plasmagenes"), while the latter summarizes the author's views on the part which the "invention" (to use his own expression) of the various genetic mechanisms discussed has played in evolution. The problem of natural selection is discussed from a genetic aspect.

The book contains an index and a bibliography of four pages. One frequently feels when reading the text that the latter is inadequate, as no reference is made to the source of many of the statements used as the basis of generalizations. There are also certain inaccuracies. For instance, the statement is repeatedly made that crossing-over is "abolished" in male *Drosophila* (Cf. p. 94), while on page 97 a description is given of crossing-over between the X and Y chromosomes in the same organism. The truth is, of course, that crossing-over is not completely "abolished" but occurs in a segment of the sex chromosomes. The objection may also be made that certain sections, which purport to be a description of various genetic mechanisms as an aid to the reader in understanding the evolutionary inferences made later, deal only with the author's interpretation of these mechanisms and, even in cases where most cytologists would not agree with him, no reference is made to alternative interpretations.

FYFE, J. L.

576.356.5:581.04

The action and use of colchicine in the production of polyploid plants.

Imperial Bureau of Plant Breeding and Genetics, Cambridge 1939 : 1s. 0d.

Pp. 10. figs.

The discovery that colchicine will produce chromosome doubling in plants was first demonstrated in 1937, and the interest in and importance of the subject is shown in the number of papers on the subject already published, a number that continues to increase. In this bulletin the action of colchicine on mitosis and meiosis is described and details are given of the various methods for the application of the treatment of the plant. The plants on which the treatment has been tried are noted. Mention is made of the drug, acenaphthene, which, as Russian workers have shown, has a similar action to colchicine and is cheaper and less poisonous.

The bibliography includes 38 titles.

ASHBY, H.,

ASHBY, E.,

RICHTER, H. and

BÄRNER, J.

58:001.4

German-English botanical terminology. An introduction to German and English terms used in botany, including plant physiology, ecology, genetics, and plant pathology.

Thomas Murby and Co., London 1938 : 10s. 0d. Pp. xi + 195. 1 fig.

Collaboration between four highly qualified botanists with linguistic qualifications was brought about by the editor of Murby's *German-English Terminology*, to produce a brief survey of botanical science in English and German, the two renderings being presented on opposite pages throughout the book.

There seems little doubt that the aim of the authors to assist the student to enlarge his vocabulary must be realized where the text is studied with industry and full attention paid to the extremely useful footnotes.

Useful appendices are given comprising lists of (1) common wild and cultivated plants especially occurring in Europe; (2) the most important common names of plant diseases (with notes on their causes); and (3) abbreviations frequently used in German botanical literature.

English and German indexes complete the volume, which can be confidently recommended not only to the student but also the more advanced worker who wishes to acquire a sound knowledge of botanical terminology in English or German.

ZANDER, R.

58:030.8

Handwörterbuch der Pflanzennamen und ihre Erklärungen. (Pocket dictionary of plant names and their meanings).

Gärtnerische Verlagsgesellschaft, Dr Walter Lang, K.-G., Berlin 1938 : III Auflage. Pp. 468.

The third edition of this excellent compendium of plant names and their meanings has now appeared. For a full review see "Plant Breeding Abstracts", Vol. IV, p. 102.

SOUÈGES, R. 581.3
 Les lois du développement. (**The laws of development**).
 Hermann et Cie, Paris 1937 : 18 fr. Pp. 94. 27 figs.

SOUÈGES, R. 581.3:582
 Embryogénie et classification. Premier fascicule : L'espèce et les classifications actuelles. (**Embryogeny and classification. Part I: The species and the present classifications**).

Hermann et Cie, Paris 1938 : 20 fr. Pp. 93. 2 figs.

In continuation of previous publications (Cf. "Plant Breeding Abstracts", Vol. VI, p. 452 and Vol. VIII, p. 88), the author discusses in detail, in the first-mentioned work, the laws arising from a consideration of the facts of embryogeny.

A study of embryogeny suggests that there is evidence of the existence of good species and of polymorphic species, and it is possible in the complex forms to trace the result of hybridization between parents of different embryogenetic developments.

The second publication discusses the idea of the species and its classification. The specific criteria, morphological, karyological and physiological, of the species are first considered and this is followed by a chapter on the chemical theory of the species, by which is meant the chemical constitution of the living plasma and which the author considers to be the only rational basis of classification. Finally, the existing methods of classification are discussed.

KOMAROV, V. L. and
 SCHISCHKIN, B. K. (Editors). 581.9(47)
 (**Flora of the U.S.S.R. Volume VII**).
 Edited by the Scientific Academy of the U.S.S.R., Leningrad 1937 : 18
 roubles. Pp. xxvi + 790. illus.

In the seventh volume of this flora, previous volumes of which have been reviewed in "Plant Breeding Abstracts", Vol. VII, pp. 256 and 443, the following families are treated: Nymphaeaceae, Ceratophyllaceae, Ranunculaceae, Berberidaceae, Menispermaceae, Magnoliaceae, Anonaceae, Lauraceae, and Papaveraceae.

The Russian and Latin indexes of orders, families, genera and species are again provided, and the editor must be congratulated on the general arrangement and production of the work, which contains numerous illustrations.

SCHISCHKIN, B. K. (Editor). 581.9(47)
 (**Flora and systematics of the higher plants**).
 Acta Inst. Bot. Acad. Sci. U.S.S.R. 1937 : Ser. 1 : Fasc. 4 : 22 roubles :
 Pp. 452. illus.

The appearance of Vol. IV of this series of publications (cf. "Plant Breeding Abstracts", Vol. VIII, p. 89), issued by the Botanical Institute of the Academy of Sciences, Leningrad, will be welcomed by those interested in plant evolution and palæobotany or in the flora of various regions and localities of the U.S.S.R.

Among the five articles in the present volume, I. T. Vasil'chenko's paper on "The Morphology of Germination in the Leguminosae in relation to their Systematics and Phylogeny" may be cited as of more general interest.

Convenient summaries and a table of contents in German or English have again been supplied as well as the essential alphabetical index of the Latin forms of the plant names occurring in the text.

The satisfactory standard of printing and binding has been maintained.

633:551.566.1:016
 Bibliographie d'agriculture tropicale 1937. (**Bibliography of tropical agriculture 1937**).
 Inst. Int. Agric., Rome 1938 : 15 Lire. Pp. vii + 420.

The seventh volume of this bibliography continues the excellent work of its predecessors (cf. "Plant Breeding Abstracts", Vol. VIII, p. 305).

The quantity of material, however, has necessitated some measure of selection and articles which only repeat what has already been published are not included.

633.11:664.641.016:578.081

Bibliography of baking quality tests. (Supplement).

Imperial Bureau of Plant Breeding and Genetics, Cambridge 1939 : 1s. 6d.

Pp. 32.

The *Bibliography of Baking Quality Tests* issued by the Imperial Bureau of Plant Breeding and Genetics in 1934 has been brought up to date by the publication of a list of titles of all available references on baking quality from 1933 up to the time of going to press at the end of 1938.

BIER, A.

633.367:576.16

Neue Gesichtspunkte in der Vererbung. (**New points of view in genetics**).

Julius Springer, Berlin 1938 : RM. 3.60.† Pp. 70.

The author has already published accounts of the transmutation he has observed in lupin species (cf. "Plant Breeding Abstracts", Vol. V, Abst. 388 and Vol. VIII, Abst. 876); in the present small volume he gives the detailed history of his observations and replies to his critics. Into his own theory he does not enter, this is to be published in a further volume.

DIEHL, R.

633.491(44)

La pomme de terre. Caractères et description des variétés. (**The potato. Characters and description of the varieties**).

Monographies publiées par les Stations et Laboratoires de Recherches

Agronomiques, Versailles, Minist. Agric. Paris 1938 : 70 fr. Pp. 157. 65 pls.

The number of potato varieties is vast and increases daily so that a complete and up-to-date account becomes an impossibility. The present work is limited to the varieties most cultivated in France and begins in Part I with notes on the characters, morphological and physiological, used in classification. Part II gives two keys for the determination of the varieties, one according to the characters of the tubers and the sprouts and one according to vegetative characters. In Part III are given descriptions of the most important varieties and those of secondary importance. Coloured plates illustrate a large number of the varieties.

HELLBO, E. and

ESBO, H.

633.491(48.5)

Systematisk behandling av våra potatissorter. (**A systematic treatment of our potato varieties**).

Skrift Stat. Cent. Frökontroll. 1938 : No. 1 : Pp. 111. 16 figs.

(Published by Lantbrukssällskapets Tidskriftsaktiebolag, Stockholm.

Price Kr. 1.90).

The work is divided into two parts, general and special. Part one is mainly concerned with the characters used in classification and their variations. Part two gives classified descriptions of 85 varieties of potato including notes on their origin and use.

TOBLER, F.

633.5(43)

Deutsche Faserpflanzen und Pflanzenfasern. (**German fibre plants and plant fibres**).

J. F. Lehmanns, München 1938 : 7 gold marks.† Pp. 139. 97 figs.

The ingenuity in extracting the most from home-grown material is instanced in the following list of plants, descriptions of which are given and from which fibres for various purposes are obtained in Germany to-day: flax, hemp, nettle, hop, broom (*Genista*), willow, mulberry, lime, reed, peat fibre, straw, grasses and rushes, *Eupatorium cannabinum*, *Daphne mezereum*, certain leguminous plants, sea grass (*Zostera*). Fibres from pine needles, the so-called "wood wool", certain malvaceous plants and fibres for paper and hairs from fruits and seeds are also considered.

The possibility of introducing new fibre plants into Germany is also suggested.

633.51:575
633.51-1.531.12

Cotton breeding and seed supply. Appendix to the monograph on "World cotton production and trade".

International Institute of Agriculture, Rome 1938 : 15 Lire. Pp. 71. 5 figs.

This little volume will be of considerable interest to the cotton breeder as a review of the present-day varietal position in the major cotton-growing countries of the world, with particular emphasis on the trends which can be discerned in breeding work. The United States, Egypt, India, China, the U.S.S.R., Brazil and Peru are the countries discussed in this connexion. The systems adopted in order to maintain the purity of cotton varieties in Egypt and the United States are also reviewed.

The first part of the book consists of a more general treatment of the methods and objectives of cotton breeding. The classification of the genus *Gossypium* is also considered, and Harland's system reproduced at length. These more general sections are well written, but the substance of them has, of course, been published elsewhere and will be familiar to most of our readers. A bibliography of 63 references is appended.

ADRIAENS, L. 633.853.55(67.5)

Le ricin au Congo Belge. Étude chimique des graines, des huiles et des sous-produits. (**The castor-oil plant in the Belgian Congo. A chemical study of the seeds, oils and by-products**).

Mém. Inst. Roy. Colon. Belge 1938 : 6 : fasc. 5 : Pp. 206. 10 figs. tables.

(Published by Georges van Campenhout, Bruxelles. Price 60 fr.).

This work, while dealing mainly with the chemical aspects of the products of *Ricinus*, includes a botanical description of the plant and its classification with notes on the principal varieties and a useful list of the vernacular names. Finally the work has shown that, regardless of origin, there is a definite relation between the average oil content and the colour of the seed.

634.771(72.92)

The report of the Jamaica banana commission, 1936.

Government Printing Office, Kingston, Jamaica 1936 : 6d. Pp. 83. 31 tables.

This report is the result of an enquiry into the Banana Industry of Jamaica and of the best measures to be adopted for the furtherance of the marketing of Jamaica bananas in the colony and elsewhere. Special consideration is given to the contribution of the Jamaica Banana Producers' Association.

BERNAZ, D.,
HOGAŞ, C. and
BILLEAU, A.

634.8

Tratat de viticultură. Vol. I. (**Treatise on viticulture. Vol. I**).

Zanet Corlateanu, Huşi 1937 : 160 lei. Pp. vii + 357. 137 figs.

In chapter I after a short historical survey of viticulture, the importance of vine growing in Rumania is noted. Chapter II deals fully with botanical characters and chapter III with the various periods of growth and development of the vine. In chapter III classification is briefly discussed and then follow descriptions of the more important species and varieties of *Vitis* and their hybrids. Chapter IV gives details of methods of propagation, especially of grafting and chapter VI is devoted to hybridization and includes methods of crossing and a short list of some of the best known hybrids of European vines.

POOLE, C. F.

635:575

Vegetable breeding.

University of California Press, U.S.A. 1937 : 75 cents. Pp. ii + 71. tables.

(Mimeographed). (Cambridge University Press, Gt. Britain and Ireland).

This publication is a summary of a lecture course in vegetable breeding suitable for students with a previous elementary knowledge of genetics. It is divided into two parts, the first

dealing with general genetical principles necessary for the plant breeder, and the second with the practice of plant breeding. Throughout the work, adequate attention is given to the mastering of statistical principles: in the first part methods are given for testing the goodness of fit of genetic ratios and for determining linkage values and correlation and regression coefficients; in the second part field experimentation (analysis of Latin Squares, randomized blocks, etc.) is dealt with. Fisher's tables of χ^2 and t are reproduced. The whole forms a very useful basis for a course of the kind intended, but is essentially a summary, and must be filled out in detail by the teacher.

SCHLOMANN, A. (Editor).

677:030.8

Illustrated technical dictionaries in six languages : German, English, French, Russian, Italian, Spanish. Vol. XIV. The textile raw materials.

Lewenz and Wilkinson, Ltd., London : Pp. viii + 500. 434 illus.

This polyglot dictionary is the outcome of well directed co-operation between various experts and technical bodies connected with the textile industry in various countries. Judging from an examination of the contents for the purpose of this review, the editor and those who have contributed words and phrases from the languages concerned are excellent linguists in addition to being thoroughly conversant with the terminology of the subject. Their aim has apparently been to provide exact equivalents in each language and not merely literal translations of technical words or phrases.

Some indication of the scope of the work may be obtained from the following main headings taken from the table of contents. General terms (pp. 1-31), including General terms of textile technics, Fundamental conceptions on the textile fibre, Botany, Agriculture, Zoology, Mineralogy, General terms used in the commerce of raw materials, General terms on forwarding raw materials; Natural vegetable raw materials (pp. 34-121); Natural animal raw materials (pp. 122-239); Natural mineral raw materials (pp. 240-41); Artificial raw materials (pp. 242-99).

The arrangement of the dictionary is extremely convenient, separate alphabetical indexes in each of the 6 languages being provided at the end of the volume.

A rather unusual, but no doubt valuable, addition to the dictionary is a short appendix of untranslatable technical terms and marks used in various countries in the commercial grading of cotton, flax, hemp, jute and wool.

Among the brief but adequate list of abbreviations is one used to distinguish the usages characteristic of the United States.

As suggestions and criticisms are invited attention might be drawn to the desirability of including the index sections, which cover pp. 312-500, in the table of contents.

The work can be highly recommended to all commercial, agricultural and other institutes or to translators concerned with the proper rendering of the foreign terminology of textile raw materials.

NEW JOURNAL

The Journal of the South African Forestry Association.

This journal, founded soon after the inception of the Association, is to appear twice yearly, in April and October. Its primary function is naturally to serve as a medium for the expression of the views of members and therefore it mostly consists of articles of particular interest to South African readers. Its columns, however, are open to contributions on any aspect of forestry or allied subjects.

It contains, in addition to original articles, sections devoted to reviews of books of interest to the forester and to correspondence with the editor.

(Published by the South African Forestry Association, Pretoria, South Africa, price 6s. 0d. per copy to non-members).

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